Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

VOL. IX | CHICAGO, MAY, 1913 | No. 5

PUBLISHED MONTHLY BY THE
ELECTRICITY MAGAZINE CORPORATION
Monadnock Building, Chicago.

Ed J. Mock and Paul H. Woodruff, Editors.
TELEPHONES: HARRISON 3014—AUTOMATIC 61028.

LONDON OFFICE.....36 Maiden Lane, Covent Garden
S. RENTELL & Co., Representatives.

Entered as second-class matter May 26, 1909, at the postoffice at Chicago, Illinois, under Act of March 3, 1879.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico	Per year,	$2.00
Canada	Per year,	2.50
Foreign countries within the Postal Union	Per year,	3.00
Single Copy		.20

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CHICAGO, MAY 1913.

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RESTORING SERVICE.

LAST month we went to press in the midst of such a tangled wreck of prostrate pole lines and desolation of inundated exchange systems as has seldom been visited upon a public serving utility. The photographs we published showed only single examples of a devastation whose complete record would fill a volume. This month we record, both in type and pictures, brief descriptions —specimens only—of the work of restoration.

This enormous task is far from completed. In some of the flooded districts the water has not yet receded sufficiently to permit a cleaning up. In some others the cleaning itself is so monumental a task that little actual reconstruction work can be done until it is finished. And everywhere is the constant demand for the telephone, more insistent in the time of calamity than before. It is an appeal that now recognizes a necessity in a former mere convenience.

But the telephone and its men have no illusions as to the difference between expediency and indispensability. That is why they are working day and night to restore to the people this modern essential, why they struggled so hard to maintain communication even in the midst of disaster.

And let it be said, this spirit is not, nor ever is, with the officials and directors and stockholders alone. The devotion of the telephone employee, from the manager down to the lowliest attache, is a thing to marvel at. Heroism, whether of the spectacular sort or the less brilliant but even more broadly effective kind that calls for endurance and persistent loyalty, becomes a mere duty to the inspired worker. Which only shows that the work of the world, be it ordinary or extraordinary, always finds willing hands to do it.

Reconstruction means incessant toil, hour after hour, regardless of nights or holidays. But it is even more than that. It is an expense approaching that of new construction; for not only must the new be installed, but the old must be removed. The loss of telephone property by flood was large; but it was only one loss where all were losers. Losses by wind and sleet are largely confined to the public utilities, and the temporary loss of their service is the public's only distress. Here reconstruction cost is maintenance cost—not anticipated, perhaps, but still arranged for in the ordinary course of business, and properly provided for in the rates.

But destruction like that in Ohio and Indiana by water, or even in Omaha, by wind, is a commutual disaster, affecting the public utility not peculiarly, but merely as a unit in the commonwealth. Here is a situation absolutely unprovided for in rate schedules, yet which must be met instantly. No matter how the ex-

penditure is accounted for later, the work must be done now.

The newspapers have been full of pictures of submerged towns, and often a telephone pole line was visible, apparently unaffected by the rush of waters. From this a layman might judge that telephone properties would show little actual damage after the water subsided. No photographs show the miles of underground cables ruined, the conduits and manholes destroyed, the pole lines that were actually swept away and lost forever. Even the exchange equipment, rusted and filled with the nauseous slime and ooze brought in by the tide—unwholesome coagulum that will not wash out or burn out—has not been illustrated. Photography demands human effort, and human effort was all concentrated desperately on one thing—restoration. But little pictorial record exists to show just how the telephone companies of Ohio and Indiana lost property whose value can hardly be less than a million and a half of dollars. The telephone-using public will never know the whole story or the herculean task; for modern service must not apologize, nor cover its lack with explanation. If there cannot be service today, there must be tomorrow. For the telephone man of the flood districts there is only one word —"Restore!"

UTILITIES IN WISCONSIN.

IN spite of the present popularity of the subject of regulation of public utilities by state commissions as material for association papers and trade journal editorials, there are many who, although vitally affected by such regulation, have not yet become familiar with its requirements.

As principle is best shown by example, and as one of the oldest and most effective examples of commission regulation is that afforded in the state of Wisconsin, the Wisconsin Railroad Commission is referred to and quoted more than any other. Harold Erickson's paper on "The Regulation of Public Utilities in Wisconsin," presented before a meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers is therefore of great interest to telephone men.

Mr. Erickson began at the beginning of governmental regulation, which meant mention of the times of ancient Rome. He gave credit to the middle ages for the evolution of the common law and the development of public control. It has been just within the last fifty years that public utilities have ceased to be luxuries and become necessities; and with this change came abuses that forced the special laws and special commissions which have had recent birth in a number of states.

In 1905 laws regulating railroads and other carriers were passed in Wisconsin and in 1907 other public utilities were protected by laws and the jurisdiction of the Wisconsin Railroad Commission extended to cover them.

The commission's duties are many, and the first of them is the enforcement of adequate service. The electric light and gas utilities have a standard set for them and they must live up to it. The voltage regulation of the electric service is such that the maximum voltage may not exceed the minimum by six per cent. Inspection of electric meters is ordered at least once a year and is tested at full, half and one-tenth load. No error of more than four per cent on any load is permitted. Each district in the state is covered by its own inspectors and thus is the regulation kept uniform.

By the general system of the inspection of gas, water, telephone and railway service, all of which Mr. Erickson explained concisely, the pressure and quality of gas, purity of water, satisfaction in telephone service, and efficiency of railroads, is made and kept a reality and the deterioration of all these things made impossible.

The subject of rates is one of the most important in the commission's range of considerations. No discrimination is allowed, yet the rates must be high enough to cover all reasonable expense of attending the operating of a plant. Depreciation as well as interest and profit must be provided by the rate charged the subscriber.

Rate-making must be governed by many things, among which are: the value of the property bearing interest and profit, cost of the physical property and of obtaining business, original cost as well as that of its reproduction, and the several classes of expenses of the various departments.

The Wisconsin Commission attributes a great part of its success to the uniform system of accounting and reports, every utility being so systematized. Those of the smaller companies are simpler than those of the larger, but all submit to an equally careful auditing. A special corps of auditors is required for this work, as the reports received yearly average 1,100. Complete accounting systems adapted to individual requirements have aided in promoting the general efficiency of the various companies.

The adjustment of reports of municipally operated utilities forms one of the most difficult problems of the commission. The same kind of report is required, by law, from the municipal utility as the one of private ownership, but the former is always incomplete and therefore has to be considered separately.

To issue securities and control the capitalization of utilities is an important duty of the commission, and the number of yearly applicants for the issuance of stocks and bonds is about 150. The object of this control is to prevent overcapitalization which would serve to keep the small local investor out of the field of public utilities. Too-high rates and the payment in dividends of earnings which should be used for repairs, thus tending to the deterioration of the plant, are two of the results of overcapitalization. Statements detailing the purpose for which the increase in capitalization is desired, together with statements of liabilities, assets, earnings and expenses must accompany the request of the applicant.

Another branch of the commission's work is the prevention of duplication and waste in both the establishment and extension of railway and municipally-owned utilities. That the public is best protected by the commission's regulation of monopolies, in the light of which public utilities are considered, is the policy of the commission. Hence, competition among such companies, as to the building of new plants and lines, except in the instances in which the public is notably the benefactor, is prohibited. A certificate must be had from the commission before such undertaking can be made by any utility.

As a seat for the settlement of differences, the commission has been especially successful. The highly technical character of the important duties which devolve upon the commission makes it important that it be removed from political influence, as in all cases it is.

The commission is a prompt remedy for the grievances arising between individuals, or the public and utilities, its help is inexpensive and, as an advisory body to the utilities, its benefits are far-reaching.

THE SERVICE ASSOCIATION.

ENGINEERING talent in the telephone field is like a great many other things; there is plenty of it to be had of a mediocre quality, but the really expert sort is rare and comes high. That is one reason why "sub-licenses" prove attractive to a good many small companies. Engineering advice from the big laboratory is an asset not to be lightly regarded.

A good part of the engineering work of the small independent companies has been done in the offices of the manufacturers of the particular equipment used by those companies. There is nothing to be said against this practice, and a vast amount in its favor. Indeed, on the independent manufacturing engineers rests a great deal of the credit for the remarkable progress of independent telephony in the face of great obstacles.

But, naturally, the manufacturer's engineer worked for his manufacturer. The condition lacked some essentials of perfection, ethically at least. When the independent operator had to spend all his time is promoting and establishing commercial standing, it was well enough to let the apparatus manufacturer handle the engineering end. But independent telephony is now established, and has been for a long time. The independent operator now devotes his time to operating and improving his service. The work requires engineering assistance, and if he is not big enough to have his own engineer, possessing one co-operatively appeals to him.

The newly organized Telephone Service Association provides just that. It acts as a consulting engineer for its members. It is to independent telephony, all the time, what the "technical conference" is to the independent convention once a year. It handles the practical operating problems of the industry as the National Association handles the political and legislative problems. Indeed, the two associations co-operate without being in any sense affiliated.

We have already told something of the organization and purposes of the Service Association; but in this issue Frank L. Eldridge, its manager, tells more. All independent operators will find his story well worth reading—and we hope all of them will be induced thereby to join and partake of the benefits of independent telephony's newest aid.

COMPARISONS BETWEEN SYSTEMS.

IN Germany they ponder cause and effect more deeply than we do, and a great many reports of tedious investigation and comparison are of German origin. Recently the interests of the savants and philosophers of that country have centered on the automatic and semi-automatic telephone, as compared to the manual. It has been our practice to publish these reports in abstract, under the head of "European Telephone Development," whenever they contained any data of real importance and interest.

This time the subject of the study is the work and efficiency of manual and semi-automatic operators, without reference to the mechanism of their operating. The fact that there is on the market in this country practically but one semi-automatic system (and, for that matter, but one full automatic) gives these articles a slightly personal flavor, which is rather deplorable. When a type of apparatus is constructed by several manufacturers, articles about such apparatus may be delightfully general and vague, easily avoiding all semblance of prejudice for or against. When a type of equipment is monopolized by a single maker, however, that maker is forced to take to himself the encomiums or criticisms which every article about the equipment must embody.

Automatic and semi-automatic telephony, however, are rapidly becoming more than a question of brand. Within the limits of patent restrictions, they seem apt to develop into a widespread principle of operating. Even Chief Engineer John J. Carty of the A. T. & T. Company predicted as much in September, 1910, at the international telephone and telegraph conference at Paris. Today many manufacturing engineers are busy on embryo apparatus of this nature.

So it behooves every telephone man to know all he can find out about systems which depend to a greater or less extent upon machinery. It is a big field with a splendid future.

TRANSMISSION.

MOST of us, when we use the word "transmission," speak in a qualitative rather than a quantitative sense. That is, while we strive to improve our transmission, we may not have a clear idea of the factors involved in high efficiency transmission. Before we can intelligently undertake the work of improvement we must have some understanding of transmission standards; where, how and why the losses occur and what must be done to prevent them.

Good transmission apparently means merely wires of the proper size, high insulation, correct transpositions and efficient transmitters and receivers. In his paper on another page entitled "Transmission Standards; Their Importance," however, A. L. Staderman points out a number of other factors that enter into the question. Especially the author points out the importance of an operating knowledge of the transmission equivalents of exchange equipment—switchboard circuits and connections, cord circuits, terminal room apparatus and exchange cabling. This is a matter of which the independent operator knows next to nothing. The information is not furnished by the manufacturer of the equipment, and few of the operators have means for making their own determinations.

Mr. Staderman suggests that the manufacturers undertake to supply data on the transmission efficiency of all the equipment which is included in a transmission circuit, and not merely on the outside conductors. In the interest of good service, this seems to be an excellent idea.

PHANTOM CIRCUITS.

PHANTOM circuit principles are simple enough, and phantom circuit practice has proven highly efficient. Therefore, it would seem that the universal adoption of the spectral connection must be inevitable, and that the smaller companies especially would hasten to adopt it where possible as a most economical method of increasing their capacity. This has not so far proven to be the case, however. It can only be concluded that the failure to adopt phantom circuits is due in many cases to unfamiliarity with them.

In another part of this number James Cavers has an article on the use of phantom circuits which, notwithstanding its non-technical nature (or, rather, for that reason), can be read with profit by all those who are not now using phantoms, and by many who are using them.

The diagrams show, in simple and easily understood form, most of the variations of the phantom which make it adaptable to almost any condition.

It is sometimes stated that the use of phantoms virtually doubles the number of lines in service. This is not quite true. It will be readily seen that the total of physical and phantom lines must always be one less than twice the number of physical lines. Thus, on four physical lines three phantoms may be built up—two directly on the two pairs of physical lines, and one secondary phantom on the pair of primary phantoms, making a total of seven. Similarly, on eight physical lines seven phantoms may be erected, and so on.

Despite their simplicity, phantom circuits make an extremely interesting study. Some of the interest may, as Mr. Cavers says, be due to the more or less romantic title and the suggestion of mystery. Be that as it may, they are valuable additions to an operating system, and something every telephone man should know all about.

PREVENTING DESTRUCTION OF POLES

Most telephone poles are liable to rot away near the base, where they are in contact with the earth, as the constant influence of moisture has its effect upon the pole. Even impregnation gives only a slight protection that should be reinforced by other methods. The process of destruction is the greater in proportion as the difference of temperature and humidity between air and earth is greater. Recently a new process called the "Knapen" process was tried out and adopted in the mountainous sections of Germany, exposed to winter storms and unfavorable conditions. A metallic cylinder, the length of the pole in the ground, is fitted around the pole. The cylinder is a little larger than the diameter of the pole and the space between metal and pole is filled with some poor heat conductor and asbestos, or any material not attacked by moisture. A metal collar with a rain hood caps the cylinder, fitting closely against the pole. In addition the pole is drilled in a slanting direction, at an angle which is the greater, the smaller the diameter of the pole. The diameter of the hole is about one inch, and this is enlarged to 1⅛ inch by burning out the hole with a red hot mandril. It is claimed that the burning of the drill hole gives the pole a uniform degree of porosity at this point. The life of the pole is said to be increased to two-thirds times the former length of service.—*Soc. Ing. Civils de France.*

Charles Bourseul died in Paris at the age of 83 years. On the 26th of August, 1854, he published an article in the *L'Illustration* in which he proposed to bring a metal plate into vibrations by means of the human voice and then to open the electric circuit of an electromagnet at a distant place, to close the circuit and thus to transmit the same vibrations to another plate at the receiving end of the line and transmit the sound of the human voice. He never carried this idea out practically, but through his suggestion is a forerunner of Bell, Edison and Hughes.

Some idea of the results of the recent snow storms in England may be gathered from the facts that approximately 1,600 miles of telegraph and telephone wires were down in the northeast of England, and that for some days Newcastle-on-Tyne was practically isolated, except for its limited means of communication by underground wires.

A Lot of Loaded Lines

EMERGENCY.

A telephone's the one best bet
In an emergency,
When trouble comes and dangers fret,
A telephone's the one best bet
When stern conditions must be met
With utmost urgency.
A telephone's the one best bet
In an emergency.

Following hard upon the world-wide announcement of the A. T. & T. pension, insurance and disability plan, the *Mountain States Monitor* (upon which we are dependent, to an extent, for some items of this column) prints a couple of clever photos showing linemen doing the human pyramid stunt on top of a pole, riding 5/16-inch messengers in gangs, and such heroic activities. For what is a leg, or even a neck, under the circumstances? Let joy be unconfined. Several millions of rate-paying telephone users stand ready to care for the relict.

THE PATIENT, NO DOUBT, IS DOING NICELY.

[From the Philadelphia *Record.*]

Dr. E. P. Cuthbert, of Evans City, wants $4 from the Bell Telephone Company and has asked the State Railroad Commission to see that he gets it. On the night of July 11, 1912, one of the doctor's patients tried to get him on the 'phone, but could not raise the operator. On account of this inefficient service the physician is out $4, which he claims he would have received from the patient.

THE SYSTEMATIZING CRAZE IN KANSAS.

[From the Hutchinson, Kan., *News.*]

No longer may the village swains drop in at the Pretty Prairie telephone exchange and chat with the central. The friendly games of pitch at the telephone office have been suppressed.

The following notice has been posted by the company:

NOTICE.

The Pretty Prairie Telephone company wish to inform the public that the telephone office is not a place for loafing or card playing. It is a place of business and business only.

[And from the Independence *Reporter.*]

SHE'S ALL RIGHT.—Miss Daisy McBee of this city, a former operator for the Home Telephone company, has been appointed chief operator at the Arkansas Valley exchange at Dodge City. The first thing Miss McBee did was to issue orders against the use of the exchange as a library, sewing circle, music conservatory or confectionery parlor. The short grass operators resented the strict discipline of the southeastern Kansas chief operator and walked out in a body yesterday afternoon. Yesterday inexperienced girls were being used on the board with more or less disastrous results to the service, but Miss McBee had won her point.

BRAVO, OLD TOP! STUDY MUSIC.

You can have your postal service or your clicking telegraph;
When need requires the instant help or care,
The telephone takes its place in the vanguard of the race
For helping to get quick assistance there.

In the Omaha affair, when e'en the very air
Spelled disaster to everything in sight,
A tenuous single line of the telephone so fine
Brought help and funds from out the dismal night.

A. L. H.

YOU CAN HARDLY HEAR IT IF YOU GET FAR ENOUGH AWAY.

[From *Popular Mechanics.*]

The new machine will have only 85 h. p., but is expected to make 60 miles an hour, and it is hoped a new muffler will make the exhaust from the engines inaudible at a distance of a few hundred feet.

THE INSPIRED AD-SETTER.

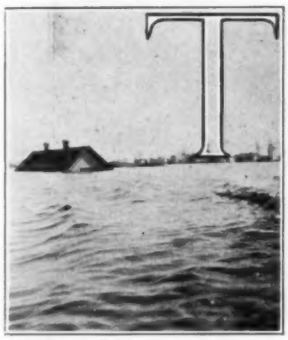
[A country weekly's "paid local."]

"I'm going out tonight—haven't a clean collar; laundry didn't come."
"Why don't you patronize Lee's Laundry?"
"He has two telephones."

What's wrong with it, children? P. H. W.

Restoring Service After Storm and Flood

Reports from the Stricken Districts



TO give even an abbreviated account of the damage to telephone property resulting from the Omaha tornado and the unprecedented floods in Ohio, Indiana and southern Illinois five weeks ago would easily fill the whole of this issue of TELEPHONE ENGINEER. We are only attempting, therefore, to relate a few typical experiences.

In the wake of the tornado that swooped down on Omaha, the evening of March 23, and devastated some hundred and fifty blocks in the residential section of the city, the Nebraska Bell Telephone Company sustained probably the heaviest individual loss, its property damage alone being estimated at $150,000.

Nine thousand telephones were severed from the exchanges, or otherwise put out of service by the storm. More than 60,000 feet of overhead cable, containing from fifteen to four hundred pairs of wires each, was twisted and bent so that it had to be replaced, and every long distance line out of the city was down.

Between the two extremes of the tornado's extent through Omaha, stretched a path some four and one-half miles in length, and from two to six blocks in width, along which the damage to telephone property, aside from the Webster exchange building, was practically total. Poles were snapped off by the hundreds, open wire circuits twisted and snarled, and heavy aerial cables tossed about like feathers.

Entering Omaha at Fifty-fourth and Center streets, the tornado traveled north, veering slightly to the east, to Leavenworth. Then it took a northeasterly course, passing seven blocks west of the Harney exchange building, sweeping away a dozen overhead cables, and completely destroying two hundred houses which had telephones operated from that exchange.

Still traveling a little east of north, the storm cut across Fortieth and Farnam, and covered a course from Fortieth to Thirty-fourth, devastating one of the best residential sections of the city. From Bemis Park, it turned sharply to the east, and passed down Parker and Blondo streets, tearing a path about six blocks wide.

At Twenty-fourth and Lake streets, the tornado struck the Webster telephone exchange squarely, blew in every window on the south and west sides of the building, lifted the roof slightly, and shattered every chandelier and light globe in the operating room. Eighteen girls at the switchboard were literally blown from their chairs, and splintered glass sent flying over the key shelves. Luckily, none of the operators were seriously hurt, the only injuries being flesh wounds from the broken glass.

From Twenty-fourth and Lake streets the storm traveled northeast, and finally, at Fourteenth and Spencer streets, went over the bluff and disappeared. Beyond the river the tornado dipped down again, destroying everything in its path. For nearly four miles along the toll lines, it zigzagged, tore down telephone poles, twisted and twirled the wires about, and cut off all communication in that direction.

After the tornado followed a deep darkness, and a dense downpour of rain. Electric lights were out, street car traffic stopped, and telephone and telegraph communication out of the city entirely cut off. Here and there a flame shot up from the ruins, giving a lurid background to the scene of devastation. Fire engines dashed and clattered. Automobiles and taxicabs speeded in and out of the storm-struck district, hurrying back and forth from the hospitals, where a procession of stretchers filed grimly through the doors. Everywhere the city was in a haze of excitement.

SERVICE IS RESTORED.

When Division Traffic Superintendent J. R. Carter reached the Webster exchange, which had been in the very center of the tornado's course, the operators had bandaged their bleeding fingers and brushed the broken glass from the key shelves; and with the floor covered with splinters, boards and debris, the girls were calmly working at the switchboard as if they had not just passed through one of the most terrible experiences of their lives. It seemed that every telephone receiver had been raised at once. The switchboard fairly blazed with signal lamps.

Radiating from the Webster exchange, two 600-pair cables and eleven of 400 pairs each, all underground, saved this exchange from being completely isolated from the rest of the city, and permitted subscribers on either side to get service after the storm. Hundreds of people rushed to this exchange, then the most substantial structure in the neighborhood. The operators' locker-room was made a hospital for the injured and a morgue for the dead, and the rest-room headquarters for the regular soldiers from Fort Omaha, who had been ordered to the storm district to prevent looting.

At the Webster exchange, amidst the screaming of hysterical women, the crying of children and the moaning of the injured, the telephone operators worked on, calmly and patiently giving what information they knew and making connections as best they could, with nearly half of the lines out of service and the switchboard a maze of light from the signal globes, evidence of hundreds seeking connection at once.

General Traffic Superintendent Cotter took direct charge at the two down-town exchanges, and Division Traffic Superintendent Kelly of Des Moines, who was in Omaha at the time, reached the Harney exchange within a few minutes after the storm. At once the work of calling in relief operators was begun. Traffic employees were sent in taxicabs, and those near by were reached on foot, and within an hour practically every operator of the 500 in the city was on duty.

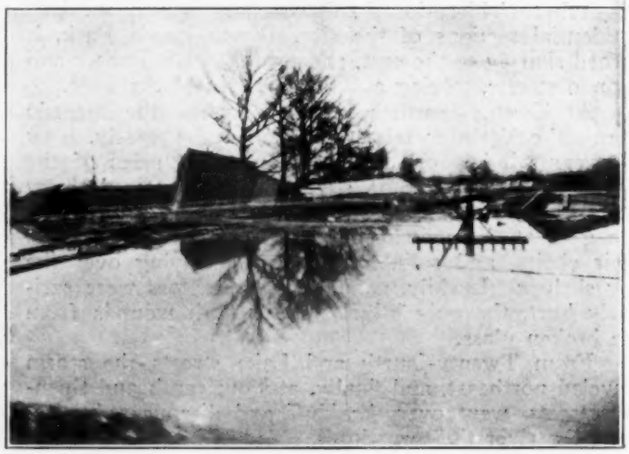
Many were the heroic sacrifices of the telephone operators for the public good that night. One young woman who had been wedged between two fallen trees so tightly that firemen had to saw the trunks in two to

Douglas and 40th Streets, Omaha, Showing Broken Poles and Tangled Wires.

Lake and 24th Streets, Omaha, East from Webster Exchange.

Damage to Central Union's Underground Cable and Conduit at North Meridian Street Bridge, Indianapolis.

Central Union's Cairo-Anna Toll Lead, with Pole Popped Out and Floating.



Cairo-Anna Toll Lead, Submerged to Top Cross-Arm.

Stringing Emergency Circuit Under Difficulties at Cairo, Ill. Central Union Telephone Company's Line.

Republican Publishing Company's P. B. X. Board at Hamilton, Ohio, Filled with Mud and Slime.

Overturned but Perfectly Intact Manhole, West End of High Street, Hamilton, Ohio. Cross Shows Former Location and Broken Conduit.

liberate her, after two hours of unconsciousness walked half a mile to the Harney exchange and reported for duty. Another woman who had left the telephone service two years ago placed her four-months-old babe with relatives, and walked ten blocks to the Douglas exchange, volunteered her services and worked till Monday noon. Fully half of the operators were on their way to the exchanges when they were summoned. Walking through the torrent of rain, climbing over fallen trees, intertwined wires and piles of debris, more than a hundred groped their way in the darkness until they reached the exchanges and reported to the chief operators. Former employees and private branch exchange operators came to offer their services, and every one was needed. Only a few who had lost everything in the storm, or were too far away to be reached, were not on duty.

HEROISM OF THE OPERATORS.

The people of Omaha will never know the debt of gratitude they owe the "central" girls for their dauntless work that night. Often during those dreadful hours life and death swung in a balance, and the human telephone did its part to move the weight in life's favor. Out of the darkness, women's plaintive voices implored aid for the injured and stern voices of men demanded ambulances and taxicabs for the wounded and dying. It was the greatest responsibility ever placed on the operating force in Omaha, but promptly and effectively they worked on, keeping open the lines to the hospitals, calling for doctors, summoning officers from police headquarters, asking for the delivery of drugs and bandages, and aiding in every way they could.

It was the faithful and efficient work of the operating force that enabled the company to maintain its service in the districts undamaged by the tornado through two days of unprecedented local and long distance operating conditions. Thirty girls who had lost everything in the tornado, were given clothes and shelter; dining rooms and sleeping quarters were provided, and everything was done to make the operating force comfortable during the days of tiresome work following the storm.

Promptly after the storm, General Plant Superintendent W. B. T. Belt was at his office, organizing his forces for the reconstruction of the damaged telephone property. Men were sent in taxicabs to outline the border of the damaged area, and to measure the extent of the loss. Messengers were dispatched on the earliest trains to the nearest telephone or telegraph offices with outside communication, to call for men and materials from the various offices of the organization. Before midnight men were on their way from Grand Island, Sioux City, and towns in the Dakotas, and early Monday morning arrived from Des Moines and other Iowa points, and that forenoon a special train was sent through from Minneapolis with men and materials. In many instances as soon as Omaha was cut off from communication, the plant men did not wait for news or instructions, but caught the first trains to Omaha.

When the plant department scouts returned from the stricken district, blue-prints were brought out, the extent of the damage outlined, and plans made to establish camps and rehabilitation districts in the storm zone. The work of restoration was under the direct charge of General Plant Superintendent W. B. T. Belt with Division Plant Superintendent E. I. Hannah, and Division Plant Superintendent A. A. Lowman, who arrived from Minneapolis Monday night, assisting him.

Thirteen camps were pitched in the storm zone, and supervisors appointed to direct the construction in each district; four cable divisions were blocked out, with a foreman directing the work of the cable splicers in each territory, and the installation of instruments and drop wire work was in charge of a general supervisor, who established seven zones, giving a district supervisor authority in each zone. By Tuesday noon, more than seven hundred men were at work, setting poles, stretching cable, stringing wire, splicing breaks and installing telephones.

WORK OF RECONSTRUCTION COMMENCED.

Sunday night, within an hour after the storm, work was begun repairing the toll lines, temporary repairs only being attempted then. Twisted and braided wire was run across piles of debris, through culverts, and trestled across streets and roads, bridging gaps across the storm belt. In Omaha, one hundred and twenty toll wires, on three pole lines, were down, for distances varying from ten to twenty-six pole lengths; but by ten o'clock Monday morning nine toll circuits had been reestablished, and before night toll lines were in service to handle all the traffic to the east and south.

Plant men from all over the northwest group of Bell companies, as well as those from connecting companies at Sioux City, Lincoln and Des Moines, responded promptly. In addition to these, prompt offers of assistance came from others, particularly from General Manager Reed of the Missouri and Kansas Telephone Company, who offered to send two hundred men. Every office of the Western Electric Company in the west rushed through materials to Omaha by express as quickly as it could be used. From Chicago, Minneapolis, Des Moines, Kansas City and St. Louis, material was forwarded to keep ahead of the army of men at work in the storm district.

The number of plant men at work during the ten days following the storm averaged six hundred and ran as high as seven hundred and fifty. The work of reconstruction took eleven miles of cable, about one mile of which was placed underground; two hundred new poles were set; 400,000 feet of No. 17 drop wire was used, and 4,000 pounds of No. 12 copper wire was needed to replace the damaged toll lines.

Throughout the work of reconstruction, when the service was badly crippled, the company received splendid co-operation from its subscribers. Announcements that every effort was being made to restore the service as quickly as possible met a hearty response from the patrons of the company, and the number of complaints were marvelously few.

Two days after the storm toll service was completely restored; and within a week practically all of the telephones that had been severed from the exchanges or put out of service by storm conditions, were in operation, except those in the 430 houses completely destroyed, and the telephone company was again operating its local and long distance lines under normal conditions.

THE OHIO FLOOD.

So much for Omaha. In the meantime the water was rising over southern Ohio, Indiana and Illinois, and the telephone companies were fighting valiantly against irresistible odds.

Assistant General Manager R. T. McComas of the

Cincinnati and Suburban Bell Telephone Company reports that about eleven o'clock on the morning of March 25, word was received from the company's Hamilton exchange that the Big Miami river was on a rampage and there was danger of the bridges being carried away and thus severing connection between West Hamilton and the main part of the town. The superintendents of equipment and exchanges, construction and cable hurried to the scene, only to find on arrival that the water had risen so rapidly that they could with difficulty reach the exchange.

Once in the building a rapid survey of the situation was made and preparations begun to keep the water out of the building, but before the preventative measures were fairly under way the water rushed down the street in front of the exchange and at 6 p. m. began to flow into the basement over the bulwarks which had been erected against it. The cellar rapidly filled, submerging the entire power plant, including the gas engine, generator, motor generator, power board and both sets of storage batteries, with the exception of the ringing generators, which were fortunately disconnected and carried to a place of safety. It was impossible by this time to enter or leave the building, as the swiftly rushing water was unnavigable.

SERVICES WITH A SUBMERGED PLANT.

The submerging of the power plant, strange to say, did not interrupt communication, and the operators remained at their posts, rendering service as satisfactorily as possible under the circumstances, as incoming calls only could be handled owing to the ringing machines being out of commission. By this time all municipal plants were out of commission; the water works, electric light plant, both sources of gas, natural and artificial, had all been suspended. A stock of candles, lanterns and a soldering furnace had been brought over from the warehouse in the rear of the exchange, while communication was still possible, and these furnished the only means of light and heat.

At 4 a. m. the following day the water reached its highest point, attaining a depth on the outside of the building of about two and one-half feet. Service was still being rendered from the switchboards, the Cincinnati-Hamilton lines on the toll board having continued in operation throughout the flood and also a few remaining lines on the subscriber sections. The submerged power plant continued to furnish all the necessary current for lighting the signal lamps and for transmission and remained in operation on the toll board until 9 p. m., March 26, and on the subscribers' board until 3 a. m. of the 27th, up to which time the operators had remained constantly at the board. When the toll board was abandoned the Cincinnati-Hamilton lines were terminated on the local battery instruments and continuous communication kept up with Cincinnati. The maintaining of these toll lines facilitated the relief work to an incalculable degree, all messages being handled without charge or question.

When the water had fallen in the basement to a depth of about one foot, men were put to work washing off the mud from the apparatus, which was covered to a depth of about three inches, and pumps were brought into requisition to pump out the remaining water in the basement. In the meantime, the construction crew had been busy and had a grounded circuit working over the river, which at once became the carrier of anxious messages of inquiry. On March 29 the lamps on the switchboard again burned with their normal brilliancy, having been out of commission thirty-four hours and twenty-five minutes. The batteries were in service without having undergone any cleaning or repairing of any kind.

Service was restored as rapidly as possible, and on the 30th of March at nine o'clock 250 lines were in working order. The work along this line has been and is still being speedily cleared up and is again approaching a normal condition, except where construction work was practically eliminated. It is estimated that about 1,000 instruments will have to be replaced, and it will require approximately 5,000 feet of underground cable and 4,000 feet of aerial cable to restore the service in the flood-devastated city. It will require months, and probably years, for the city to entirely recuperate, and as the restoration of the service will probably keep pace with the new growth of the city, it may readily be seen that Hamilton will prove a field of activity in the telephone line for some time to come.

DESTRUCTION BY FLOOD AT CAIRO.

The report of Commercial Manager Schmutte of the Central Union Telephone Company at Cairo, Illinois, gives a graphic account of flood conditions there. With forty-five poles down in the Wickliffe bottoms, just north of Wickliffe, Ky., Cairo lost service over the following circuits: Three physical and one phantom to Wickliffe, one Memphis physical, two Paducah physical, two Union City physical and one McKenzie phantom. These went in trouble about the first of April, but by stringing approximately 60,000 feet of twisted pair, the Cumberland Telephone Company, which owns these circuits, was able to have them all in service within a week. Two direct St. Louis-Memphis circuits on the same lead that under normal conditions are cut in at Cairo only for test, were dropped at Cairo when the south end of the lines went out, thereby giving additional facilities for service with St. Louis. This came as a godsend to Cairo, as lines to St. Louis were very much in demand at that time. Service with St. Louis was at no time interrupted, as the A. T. & T. Company, anticipating trouble, had stationed a crew of men in the flood district, who, by free use of twisted pair, managed to keep their circuits working.

On the 3rd of April four circuits, giving Cairo connection with points in southeastern Missouri, and that cross the river through submarine cable, went out. One of the circuits, known as the Cairo-Dexter circuit, was out but one-half day however, so Cairo was at no time entirely cut off from southeastern Missouri connections. All points reached under normal conditions via Charleston and Sikeston, Mo., were reached through Dexter over this one remaining circuit.

At the time the Ohio and Cache levies, which protect the Cairo drainage district, broke, allowing the waters of these rivers to flood the country north of Cairo, two of the company's toll circuits, one terminating at Anna, Ill., and the other at Mounds and Mound City circuit, were put out of service; likewise a farmer line connected with the Cairo exchange, which extended for approximately nine miles into the country north of Cairo. The water in many places was thirty feet deep and at a number of points covered the company's lead entirely. This happened on the 4th of April. A force of men were put on the job immediately however, and by the 7th had re-established service with the three toll points mentioned by stringing about four and one-half miles of twisted pair. Some of the photographs show the con-

ditions which they had to contend with in stringing this emergency line. Probably forty per cent of the poles composing this lead were either broken off or popped out of the ground and floated away. They managed to save a number of them, however, by rounding them up with a motor boat and anchoring them to trees along the right of way, to be re-set after the water had gone down.

It will probably be some time before that part of the country, drained by the Ohio and Mississippi rivers and their tributaries, will forget the flood of 1913. Not the least of those who have suffered are the telephone companies, and they so heavily that an indelible memory will always remain.

RUSHING SUPPLIES FOR RECONSTRUCTION.

Information continues to come to hand of measures taken for relief of the telephone and telegraph means of communication and electric light and power lines, following the effects of the flood throughout the Middle West. The rapid succession with which the sleet storm at Chicago on March 20 was followed by the tornado at Omaha on March 23, and then the floods in Indiana and Ohio on March 24 left the usual sources of supply for line construction material in far from the best shape to meet the enormous demand which was to follow the recession of the waters. In fact, the suppliers of wire,

Looking North on Washington St., Tiffin, Ohio.

cross-arms, etc., were in none too good shape when the Chicago sleet storm of March 20 struck them, as, it will be remembered, it was the second in that territory within a month. The Western Electric Company reports that following upon the first sleet storm of February 20, it shipped out from Chicago over 400,000 pounds of hard drawn copper wire and much line hardware, but fortunately, it had large stocks of all these materials in its Minneapolis, Kansas City, Omaha and Des Moines warehouses to meet the demand brought about by the second sleet storm.

When the demands for material from the flood centers began to arrive, all sorts of expedients had to be resorted to to get the material where it was wanted. One entire carload of emergency line material, which the company endeavored to ship by express to Cincinnati, neither the express companies nor the railroads would undertake to deliver, and the car was routed from Chicago to Nashville in the hope of approaching Cincinnati from the south. Unfortunately, however, just as the car was about to arrive in Cincinnati, the flood in the Ohio river reached that point, and several days delay ensued. Not until April 2 did the transportation companies accept express shipments for Ohio and Indiana points, but, anticipating this delay, the company forwarded from Chicago to Toledo several carloads of material intended for Columbus, Dayton, Zanesville and Springfield. They were billed to Toledo in the expectation that when traffic was opened up they might be moved forward with less delay. This expedient proved a wise one, as these cars were among the very first to get through to the districts that had been submerged. Dayton alone ordered 5,000 telephone subscriber sets, besides enormous quantities of wire for both inside and outside use. The subscriber sets were used to replace those which had been water-soaked. Along with them went 40 private branch exchange switchboards for use in business offices in and around Dayton.

In the cable plant of the Western Electric Company at Hawthorne there was ready for delivery several carloads of cable, to be shipped to distant points in the United States. As the need arose, permission was secured from the telephone companies by whom this had been ordered to divert it to the emergency use where it was required. This stock formed a valuable addition to the regular emergency stocks carried at the factory, and within the space of a few days over 500,000 feet of cable in sizes ranging from 25 to 400 pair were shipped out from Hawthorne. 300,000 pounds of this went by express, and upon it the express charges aggregated over $6,000. This was, of course, only the first call for construction material and represented as much as could be handled by the construction gangs in the first few days after the water had subsided. The factory was at once placed on a night and day basis and later orders are being filled in the order in which they are received.

Gutta-Percha vs. Paper Insulated Cables

Gutta-percha cables are much superior to paper insulated cables as regards mechanical properties. The former can be laid at greater depths, as they offer greater resistance to water pressure and give much better results than paper cables surrounded by a lead sheath. The latter must be reinforced by a protective outside coil made up of 2 mm. wire, if they are to be used for submarine cables. Paper cables are easily damaged, if the outer sheath is injured, due to the hygroscopic action of the paper. The paper cables are also very heavy on account of the lead armor.

To judge the electrical properties we must take the ratio between conductivity and capacity as a standard. The lower this ratio, the better is the material. The investigator figured the specific damping effect of both types of cables of equal dimensions both with and without Pupin coils and found that the conductivity in non-Pupinised cables had very little effect. The greatest differences between both was less than 1 per cent. In Pupin cables the damping effect increases by 66 per cent, the ratio between conductivity and capacity being between 15 and 100. With the same dimensions, the best gutta-percha cables have a damping effect which is 40 per cent higher than that in the best paper insulated cable. The lead sheath has little influence on this ratio. We can therefore say that in electrical properties the paper cables are superior to gutta-percha cables, and that they are about equal in mechanical properties. Paper cables should only be used in shallow lakes where they can be raised without trouble.—*Archiv für Elektrotech.*

Transmission Standards; Their Importance

By Alfred L. Staderman

THE purpose of the telephone is the transmission of speech; or, to be more exact, the reproduction of speech by electrical means; in other words, the conversion of sound waves into electrical waves, and the reconversion of electric waves into sound waves, this process being known as transmission. It is apparent that the subject of transmission is of very great importance to the telephone business, as it is the very foundation of good telephone service, for without good transmission the traffic and commercial departments of a telephone company are helpless to serve the public.

The problems of transmission are not serious for entirely local systems or short toll lines, but they become very serious when transmission over a great distance is attempted, for then the losses approach the limit of transmission. As a long distance call may originate at any time from any telephone, there are few entirely local systems, and hence transmission is important for all telephone systems, if the public is to get adequate service.

The subject of transmission was not important to independent telephony until real long distance talking was attempted. The independents have developed the local field and the short haul toll field. There still remains the problem of giving service over circuits usually classed as long haul long distance.

In the early days any kind of circuit or equipment would give satisfactory service, as the limit of transmission had not been reached; but as the public is now demanding long haul long distance service from the independent companies, it becomes necessary for them to consider seriously the subject of transmission losses.

One difficulty about the subject of transmission is the fact that it cannot be measured as readily and simply as every day electric currents are by means of instruments in common use, hence transmission measurements are not made as often as they should be. In order to measure the transmission equivalent or losses of any circuit, an arbitrary standard circuit is most generally used, against which the unknown transmission is compared. The standard artificial line is so adjusted as to balance the actual line under test, so that no difference will be noted when rapidly switching from the actual to the artificial line. When this balance is obtained, the transmission equivalent of the unknown line is obtained by noting the amount of artificial line inserted.

The unit of this artificial line consists of a mile of a standard cable arbitrarily chosen, and which has the following properties: Mutual capacity .054 microfarads per mile; loop resistance 88 ohms per mile; and inductance and leakage negligible. This corresponds to No. 19 B. & S. gauge paper insulated cable such as was in common use up to a few years ago for local service before No. 22 gauge cable was developed.

In comparing the qualities of transmission of one circuit to another, the different circuits are expressed as having a transmission, equivalent to a given number of miles of standard cable. Thus, an 18 mile standard means transmission equal to talking through 18 miles of standard cable, using standard terminal equipment. In other words, standard No. 19 gauge cable is used as a yard stick, so to speak, in measuring transmission losses or equivalents.

Transmission has two qualities: Volume and articulation. Two circuits may have the same transmission equivalent in regard to volume, but may not be so as regards articulation, as articulation is diffcult to compare.

The standard of transmission generally used in telephone work varies from about eighteen miles of standard cable for local service up to a limit of thirty miles of standard cable for long haul long distance service. This does not mean that you could talk through the equivalent of thirty miles of cable with any kind of terminal equipment and obtain this limit, but means the sum total of the losses of substation, central office, and line losses should not total more than thirty miles.

As there are but thirty units of transmission loss to be used, if a large number of these are lost in the subscriber's instrument and the central office switchboard, there remain proportionately less to lose on the line, which means that the wire of the line has to be better to make up for losses in equipment. As there always will be terminal losses, it is very necessary to allow for these in designing the line.

The absolute limit of transmission varies from forty to sixty miles of standard cable, depending upon the powers of hearing of the listener. As the public cannot be expected to be expert, thirty miles is taken as the commercial limit. Even this limit within the last few years tends toward reduction on account of the ease and low cost with which improved transmission can be obtained by loading circuits; that is, using retardation coils in series with the line at given points. The practice of loading is as yet restricted to Bell companies on account of patents, and hence it behooves the independent companies all the more to eliminate all possible losses caused by substation and central office equipment.

The purpose of this paper is to call attention to the importance of transmission losses, and not to give a technical presentation of the subject; nevertheless, it might be allowable to digress somewhat to consider briefly the factors that determine the quality of transmission.

The different factors determining the qualities of transmission of any circuit consist of resistance, capacity, inductance, and leakage or insulation; and a fifth factor may be added which enters into the problem in open wire lines, *viz.*, outside interference, such as induction from neighboring circuits. All five of these factors are important in open serial wires. In cables, however, all but resistance and capacity can be neglected for practical purposes, so that the calculations of the equivalent of one kind of cable compared to another are relatively simple compared to that of open wire lines.

The losses of a telephone circuit may be divided into three classes: Line losses, substation losses, and central office losses. The line losses are further subdivided into cable losses and open wire losses.

OPEN WIRE LOSSES.

The open wire losses are made up of five factors, as mentioned above: Resistance, depending upon the size, length and kind of material; the capacity, which is independent of the materal, but dependent upon the

size, spacing and length of the wires; the insulation, or leakage, depending upon the style and number of insulators per mile and foreign contacts; self induction, depending upon the length, material, and spacing of the wires; interference, depending upon the proximity of wires carrying currents affecting the telephone wires.

The resistance can be reduced by increasing the size of the wire, but increasing the size of the wire also increases the capacity, and the full benefits are not obtained of the decreased resistance. For this reason copper wire has greater transmission efficiency than iron because it combines low resistance on account of its low specific resistance with low capacity on account of the smaller size necessary when compared with iron wire.

The capacity of a wire can be reduced by reducing the size of the wire, but this, as mentioned above, would increase the resistance, so this is not feasible. By giving the wires a large separation, the capacity would be reduced, but this is not practical, as pins are usually spaced either ten or twelve inches apart. Loading is the method used of neutralizing the effect of capacity.

Leakage can be reduced by keeping the wires clear of trees and other foreign contacts, and by not using insulators of too small a type. The lower the resistance of the wire, the more important it is to keep the leakage low, or, in other words, insulation high.

The transmission equivalents of different kinds of wire are based on an insulation resistance of 32 megohms per mile. So long as this does not become less than about two megohms per mile, the transmission is not seriously affected, but when the insulation drops to a lesser amount, the losses increase rapidly. The more efficient the circuit, the more pronounced and early is the effect of leakage.

The self induction of a wire has within limits a beneficial effect on transmission, as it neutralizes the evil effect of capacity, and is one of the reasons for the better talking qualities of open wire compared with cable. The method of loading a line makes use of the above fact by inserting coils having self-induction in series with the line wire, which coils are so proportioned as to neutralize the effect of capacity.

Interference can be avoided by a proper system of transposition, and having as great a space as possible between the telephone wires and disturbing wires. A small noise may cause a transmission loss equivalent to several miles of cable.

CABLE LOSSES.

Cable circuits cause a much greater loss than open wires owing to the fact that usually the conductors are of a smaller size, producing high resistance, and being crowded together more closely the capacity is also much greater than that of open wires. In cables self-induction and leakage can be neglected for practical purposes, so that the calculation of the equivalents of one kind of cable in terms of another is comparatively simple compared with that of open wire lines.

The transmission losses in a cable are practically proportional to the square root of the product of the mutual capacity and resistance. Hence, after this quantity is known for standard cable, which amounts to 2.18, the equivalent of any other cable can be determined by finding the value of the square root of the product of the mutual capacity and resistance and dividing by 2.18. It thus will be seen that if the capacity of two cables are equal, the transmission is proportional to the square root of the resistance. In other words, keeping the capacity per mile the same, to double the efficiency or talking limit of a cable it is necessary to quadruple the size of the wire. This will indicate how rapidly the cost rises in obtaining improved transmission in telephone cable. Thus, No. 19 gauge cable has an equivalent of unity, or one mile loss per mile; while No. 13 gauge cable, the wire of which is four times as heavy as No. 19, has a loss of half that of No. 19 gauge cable, or is only twice as efficient.

The following are approximate values of transmission limits, or the length of line of various kinds of cable and open wire, having a transmission loss equal to thirty miles of standard cable:

CABLE.

No. 22 B. & S. G. .083 mfd. mutual capacity.....	18 miles
No. 20 B. & S. G. .074 mfd. mutual capacity.....	23 miles
No. 19 B. & S. G. .074 mfd. mutual capacity.....	27 miles
No. 19 B. & S. G. .054 mfd. mutual capacity.....	30 miles
No. 16 B. & S. G. .074 mfd. mutual capacity.....	39 miles
No. 14 B. & S. G. .074 mfd. mutual capacity.....	48 miles
No. 13 B. & S. G. .074 mfd. mutual capacity.....	55 miles
No. 10 B. & S. G. .074 mfd. mutual capacity.....	77 miles

OPEN WIRE.

No. 14 B. W. G. Iron.....	75 miles
No. 12 B. W. G. Iron.....	94 miles
No. 10 B. W. G. Iron.....	120 miles
No. 12 B. & S. Copper.....	246 miles
No. 10 B. & S. Copper.....	353 miles
No. 9 B. & S. Copper.....	429 miles
No. 8 B. & S. Copper.....	526 miles
No. 6 B. & S. Copper.....	811 miles
No. 8 B. W. G. Copper.....	857 miles
No. 12 N. B. S. Copper, Loaded.....	909 miles
No. 8 B. W. G. Copper, Loaded.....2,000	miles
No. 8 B. W. G. Copper, Loaded, Phantom.....2,273	miles

The phantom circuit of a cable is from eight to ten per cent better than the physical, while the phantom circuit of an open wire is from fifteen to twenty per cent better. It will be noted that the talking limits vary from 18 miles for 22 gauge cable to 2,273 miles for No. 8 B. W. G. loaded phantom such as is used in talking from New York to Denver. This is a wide range, and gives a choice of conductors to use for any given transmission between any two points within given limits.

Knowing the above limits and the performance of substation and switchboard apparatus, the matter of designing a telephone plant for given results becomes an exact science. It is unfortunate, however, that the transmission equivalents of substation and switchboard apparatus of various manufacturers are not known nearly as well as the equivalents of different kinds of wire and cables.

CENTRAL OFFICE LOSSES.

To analyze all the possible losses in central office equipment is a problem too large to be here attempted. It might be said briefly that the losses come under two main heads: Faulty circuit design and faulty equipment. There are some circuits in use which would produce great losses, even if the equipment were the best, and there are other circuits which, while correct in design, are deficient because the equipment used is of poor design. Between these two possibilities there can be any number of variations, too numerous to mention.

Faulty circuit design results from giving too much attention to elaborate signaling systems and ignoring possible transmission losses. Only too often signals have been given preference over transmission.

Equipment losses are frequently caused by using steel instead of tinsel cords on toll boards, and worse

still when used in circuits supplying the battery to a common battery telephone when connected to a toll line. One of the great sources of losses is inefficient repeating coils. The loss in these may vary from one-fourth mile to four miles or more of cable. The method of supplying battery to a common battery telephone may cause a loss equivalent to five miles of cable. Most circuits do not supply sufficient battery to the transmitter on long distance connections. The effect of operators listening in on a circuit may cause a loss equalling anywhere from zero to three or more miles of cable. In addition there are the losses of coils of low impedance bridged across the line and of heat coils, carbon grounds, and dirty key and jack contacts.

SUBSTATION LOSSES.

Substation losses may be caused by faulty circuit designs or faulty equipment, and other general losses. There is quite a variety of circuits in use which vary greatly in their transmitting efficiency. Even with the best circuits there still are possibilities of faulty equipment, causing losses as follows: Transmitters packed or adjustment too tight; receiver out of adjustment; diaphragm dented; coils partly short circuited; receiver magnet too weak; induction coils inefficient; low resistance ringers bridged across the circuit, or, worse still, in series with the circuit; cords noisy or of high resistance; local batteries exhausted, or, if common battery instrument, battery too weak on account of high resistance of the subscriber's loop; the hook switch might make poor contact; and general losses may be caused by faulty wiring and carbon grounds.

The possible transmission losses in a common battery instrument are much greater than in a local battery instrument on account of the effect of the resistance of the subscriber's loop upon the amount of battery that is supplied to the transmitter. For this reason the transmission losses of the common battery telephone are divided into two classes, one known as high frequency loss and the other the current supply loss. The high frequency loss is the reduction which the high frequency electrical waves suffer when passing over a circuit. The current supply loss is the loss occasioned by the reduction of current furnished to the transmitter on account of the resistance of the subscriber's loop. Thus a loop consisting of one mile of standard No. 19 gauge cable would have a high frequency loss of one mile; in addition the loop would have a current supply loss depending upon the switchboard circuit and telephone used, but under the most favorable conditions would amount to one, and even as high as three miles additional loss. Hence it is important to keep the resistance of the subscriber's loop within prescribed limits. The current supply loss of the loop usually amounts to more than the high frequency loss. The current supply loss does not affect the receiving efficiency, but only the transmitting efficiency of the instrument.

There is a wide range in the efficiency of magneto telephones on the market, some being better than a standard instrument, and quite a few of them averaging five and even more miles worse. Assuming an instrument of the latter kind in which the batteries are run down, which will cause an additional loss of about four miles, it is not surprising that transmission is poor even with good lines, or good when talking to one subscriber and poor when talking to another in the same exchange.

It is unfortunate that all manufacturers are not in a position, or refuse, to state the efficiency or performance of their various equipment, and that the consumers do not demand it. The result is that much inefficient apparatus has been and is being manufactured. There is no more reason why telephone companies should buy equipment about the exact performance of which they know nothing, than it would be for power stations to buy engines and generators of which they do not know the performance.

In addition to the above possible losses, there is still a possibility of losses being introduced on account of using good equipment in the wrong manner, such as using the wrong cord circuit in putting up a toll connection where several kinds of cords are on the same position of the toll board, or by completing the connection through a recording trunk instead of the specially designed service trunk, or by building up a circuit by connecting a poor iron circuit between two copper circuits because it so happens that the intermediate copper circuit was busy, and, the chances are, busy on a short haul call for which the iron circuit was intended.

As an illustration of the importance of terminal losses consisting of switchboard and substation losses, the following hypothetical case will be considered: A telephone connected directly to the private branch exchange siwtchboard; this switchboard connected over a two-mile 22 gauge trunk to a branch office which is connected to a toll board over a 19 gauge trunk one mile long, and assuming that the toll operator and the private branch operator are listening in on the circuit. Under this condition the losses would approximate thirteen miles of cable. Assuming that the equipment on the other end would be the same, the receiving loss would be about nine miles, as there would be no current supply loss. Hence, the combined loss, excluding any toll line loss, would be twenty-two miles, leaving only eight miles to be lost in the toll line for a 30 mile standard. This would not allow of a very long line without soon exceeding the commercial transmission limit. While this is perhaps a severe condition, nevertheless it is one met with in metropolitan practice, and has to be reckoned with and treated in a special manner, and shows the difficulty of maintaining high transmission in large cities.

From the above it will be evident that it is very important to think not only of the line losses, but also the substation and central office losses. Almost every telephone company could make great improvement in transmission conditions if a study were made of the various equipment used, a few dollars spent in changing the equipment having often the same effect as greatly increasing the size of the wires on the toll lines at many times the cost of changing the substation or central office equipment.

The advantages of good transmission are several, one being the increased traffic, for good transmission causes subscribers to be more apt to use the long distance lines. It also facilitates the operators passing calls, as no repeating is necessary and hence less labor is required in making the connection and thus reducing the operating cost per call. It also enables more calls to be handled over a circuit, as subscribers say in a shorter time what they have to say over a good circuit than over a poor circuit, which requires much repeating with the resultant rebate which the telephone company must allow for poor service.

While it is true that the long haul long distance business is not as profitable as the short haul, and that the amount of long haul business is small compared with

the short haul business, it is nevertheless necessary for a telephone company to be able to give both services if prestige is to be maintained for serving the people and competition properly met.

In building a telephone plant, it should be decided what standard of transmission is to be given over the various local lines, as well as the long distance lines, so that the proper outside and inside equipment can be selected to obtain this transmission. Only too often plants are built largely by rule of thumb, and not according to the dictates of good engineering practice.

A few years ago little was known with exactness in regard to the transmission equivalents of apparatus and lines. Regarding the line, this is no longer so, and telephone engineering has made rapid strides towards becoming an exact science. Much, however, still remains to be done before as much exact information is available to a designing engineer regarding the performance of the different kinds of substation and central office equipment of various manufacturers as there should be in order to eliminate all guess work.

The lack of knowledge of transmission equivalents has resulted in money being spent where it should not have been, and thus wasted and not put where it should have been. This is a very important matter when expenditures run into such large sums of money as in the telephone business. It is to be hoped that the Telephone Service Association may be the cause of obtaining much of the information which is now lacking regarding the performance of the various makes of apparatus.

Owing to the severe competition between manufacturers and the unappreciativeness of efficient apparatus by many telephone companies, it has happened only too often that the saving of a few cents in the first cost of equipment has been allowed to reduce the efficiency of transmission. The result is that instead of paying a few cents more for efficient apparatus, dollars must be spent to make up for equipment losses by increasing the size of the toll line wire. It is evident, therefore, that it is good economy to get the most efficient apparatus irrespective of the slightly increased cost, for to obtain the same improvement by improving the line wires costs many times more than the equipment.

The transmission equivalents given for different equipment assumes that all equipment is in ideal condition. As this is hardly ever possible, the need is very evident of having a margin to allow for any losses due to conditions not ideal. For if good service is to be given day in and day out, there must be a margin allowing for bad weather losses and other slight failures of equipment which are bound to happen. As enumerated above, there are many things that will happen that tend to decrease the transmission, but few, if any, that will improve the transmission.

Good transmission is of utmost importance in order to meet competition. Only too often one will hear the independent telephone called the local telephone and the Bell telephone called the long distance telephone. This is the result of the early days of telephony when independent long distance lines did not exist, so that today the independent companies have difficulty in getting their proper share of the long distance business on account of the fixed notion in the mind of the public.

Many companies are not getting the benefit of the investment they have in their heavy copper lines on account of poor maintenance, which should be very evident; and also an account of losses in switchboard and subscribers' instruments, which losses unfortunately are not so evident, but exist nevertheless.

Transmission can be much improved by remedying little things at a small cost, as in the past there has been much equipment made in the early days which has considerable transmission losses and which is still in use and interfering with good long distance service.

It is not sufficient for one company at one end of the line to use care regarding transmission, as the terminating company or an intermediate company might introduce large losses which could easily be avoided, and which nullify any good work done by another company. Hence, every company should make an examination of its conditions and rectify anything that needs attention, and in this way improve the standard of independent long distance service, and reap the financial reward which will follow.

French Telephone Service Poor and Annoying

The Chinese telephone service is perhaps as bad, but certainly not worse than that of Paris, which is operated by the government, says the Denver *Republican.* American visitors prefer taking a taxicab to trying to communicate with any one by telephone.

Besides the difficulty of pronouncing the French numbers, there is something most confusing in having to talk aimlessly in the direction of a seemingly blank wall. The French telephones have no mouthpieces or other device in which to talk, the subscriber, customer, victim, or whatever he may be called, merely shutting himself in a booth and talking to a piece of yellow plank which he learns at some time or other in his attempts at being friendly is a sounding board.

An annoying instance of telephonic incompetency came up recently when Doctor Serison complained of being constantly annoyed by calls from various persons whom he did not know, but who familiarly ordered him to call for their laundry or urged him "to come over to the club and take a hand at bridge."

When he investigated he found that the telephone "central" had mixed up his number with those of a highly respectable washerwoman and a most notorious sporting club. So the affable doctor brought suit before a magistrate. He was awarded $40 damages against the state. The latter appealed to a higher court, which reversed the decision, declaring that the lower courts had no right to grant damages against the state for errors due to the negligence of its employees, even in a case of operating a public service akin to a private enterprise.

Commended for Telephone Enunciation

Recently a firm employed a new man in its office. He was called upon to transact considerable business with a neighboring concern over the telephone. A few days after his arrival one of the officers of the company met one from the other concern and was immediately asked about the new man. Upon inquiring the reason for this special interest, he was told: "His voice is as clear as a bell over the telephone and every word he utters can be understood perfectly." The person who made this comment talks daily with many people over the telephone, both local and long distance, but this one man's voice was the only one which was particularly noticeable to him, his interest being directed to it by the clear, pleasant enunciation, says *Popular Electricity.*

Installation at the McAlpin Hotel

By J. N. C. Graham*

TWENTY-THREE stories above the sidewalk at the intersection of Broadway and 34th street, New York, the largest Private Branch Exchange switchboard ever installed serves the Hotel McAlpin. This switchboard could easily have cared for the service of the Harlem, Riverside, Madison Square, Lenox or John Street central office districts at the time those offices were opened on a common battery basis, about thirteen years ago. At that time the New York Telephone Company's largest private branch exchange switchboard had only three positions, and less than two hundred extension stations.

About two thousand square feet of space is required for the telephone quarters. The operating room is 60 feet by 19½ feet; the terminal room 24 feet by 19½ feet and the retiring, locker and wash rooms combined are 30 feet by 14 feet. This space is equal in size to about twelve typical bedrooms. If used for this purpose, it would rent for about $13,000 per annum.

THE SWITCHBOARD.

The switchboard has a capacity of 2,000 lines. There are five ringdown trunk positions, one local trunk and house service position and ten subscriber or guest positions. Each of the 16 positions is equipped for telautograph service. The circuits are the same as those of a standard No. 1 lamp switchboard without line relays. There are working in the switchboard 1,625 subscriber lines, three tie lines, ten local trunk lines and 75 trunk lines to the Greely central office. The so-called official lines which serve the various departments of the hotel are multiplied throughout all of the positions.

*From the *Telephone Review.*

SWITCHBOARD LIGHTING.

Heretofore telautograph switchboards have been provided with a reflector, set out from the face of the board so as to illuminate the space below the telautograph receivers which hang over the jack equipment. At the McAlpin, this reflector is omitted and the general illumination of the operating room light the switchboard in the same manner as at standard central office and lamp private branch exchange switchboards.

THE OPERATORS' QUARTERS.

The chief operator has six extension lines. In addition, instruction and listening-in circuits connect her desk with the several positions of the switchboard, with the public station switchboard and with the information clerks. The desk is also equipped for telautograph service. With this arrangement the chief operator can readily supervise the work of all the telephone operators. Also she can personally transmit by telautograph any special orders or information which may be referred to her by the operators.

Comfortable quarters with all necessary conveniences have been provided adjacent to the operating room. The assigning of valuable space for this purpose is now generally recognized by large p. b. x. subscribers as a good investment. It enables the operators to obtain the maximum benefit from their rest periods and thus do better work when at the switchboard.

THE OPERATING FORCE.

To operate the hotel switchboard and public telephone station requires a force of 44. This force is in charge of a day and night chief operator. Each chief operator has two floor supervisors. Reporting to the

Main Switchboard—16 Positions, Each Equipped with Telautograph Instruments.

Twenty-first Floor Pantry. Showing new type metal flush mounted wall set.

supervisors are 34 operators and four messengers. During business hours the main switchboard requires from 12 to 14 operators and the public telephone switchboard requires two operators, a cashier and a messenger.

The telephone operating force is probably one of the most important units in the hotel organization. It is estimated that they will handle 500,000 local messages annually. Also they care for an enormous number of incoming calls in addition to the house-service traffic. Every morning the operators call 500 sleepy guests to enable them to catch trains or to keep business or social appointments. All orders from the guests' rooms are given to the telephone operators who transmit these orders by telautograph to the proper departments. Copies of the orders appear on the telautograph receivers at the floor clerk's desk. One of the functions of this clerk is to see that the orders receive prompt attention. The telephone is a very important factor in this supervisory work.

MAIDS' ANNUNCIATOR SERVICE.

Another new departure in this hotel is the installation of the maids' annunciator in the operating room. This annunciator or system is not part of the telephone installation. It is of interest, however, because of its close association with the general operation of the switchboard.

It is the present practice to install in modern hotels a system whereby the location of the maids on the various floors can be readily determined. At the McAlpin this is accomplished by an annunciator, in which are mounted lamps for each room in the hotel. This annunciator is 13 feet long and 3 feet wide. It was the original intention to mount it above the switchboard in such a manner that the operators on the subscribers' positions could readily see it. It was impossible to find a satisfactory location to accomplish this feature, consequently the annunciator was suspended from the ceiling in back of the operators.

The annunciator lamps are wired to a socket mounted in the door frame of the room to which it corresponds. When a maid enters a room she inserts a lamp or short-circuiting plug in the socket. This lights the lamp in the annunciator, thus indicating the location of the maid.

When a guest calls or a maid, the operator receiving the call advises the supervisor, who in turn informs the operator where the maid nearest to the calling room is located. The operator then calls the maid over the telephone circuit to the room in which she is working and gives her any instructions required.

INFORMATION CLERKS.

Three clerks are required in the hotel office to furnish the telephone operators with information to enable them to complete incoming calls for guests. These clerks are known as information clerks. Two of them have breast transmitter sets and special monitors equipped with calling circuit keys. These sets are connected to order circuits from the switchboard.

Whenever an operator requires information regarding a guest, she gives the facts, together with her position number, to the information clerk over the order circuit. The clerks are within reach of the hotel records and can, therefore, give prompt advice regarding the movements of guests and the location of guests' rooms. When the information has been obtained, the clerk presses the calling circuit button in her monitor which corresponds to the switchboard position of the operator requesting the information. This lights a lamp in front of the operator who goes in on the circuit and is given the information required. This method of operation is speedy and avoids any chance of the information clerk

Main Public Telephone Station. Fifteen receding door booths and four open stations. This is one of the busiest portions of the hotel.

interfering with any switchboard connections which may be in progress.

The third clerk acts as a supervisor. She checks the reports of the two operating information clerks, gives personal attention to calls for guests who cannot be readily located and cares for changes in the hotel records. In order to avoid confusion and misunderstanding, it is essential that these records be posted promptly. Registration has at times been at the rate of 120 guests per hour.

At present the information clerks are handling daily between 7 a. m. and 12 midnight 800 information calls. These calls are often at the rate of 200 per hour.

PAGING.

Few people realize the difficulty experienced in locating guests of a hotel to deliver messages or advise them of telephone calls when they are not in their rooms. These difficulties are in direct proportion to the size of the hotel. Not only must the page find the guest, but he must do so in a reasonable time. Waiting is a tedious task to the person at the far end of a telephone line. Delays must therefore be avoided as they reflect seriously upon the general efficiency of the hotel service.

At the McAlpin the page system is unique in that it is operated from four different points simultaneously. The telephone operator delivers her message by telautograph to each of the page centers. Each center is equipped with two telautograph receivers. The message is, therefore, reproduced at eight instruments. Each copy of the message is taken by a page who covers his rounds in about two minutes. Thus in this short time the entire public portion of this large hotel can be paged for a guest.

To operate this system requires the hourly use of 780 feet of paper, 5 inches wide. The paging messages are frequently at the rate of 75 per hour.

THE TERMINAL ROOM.

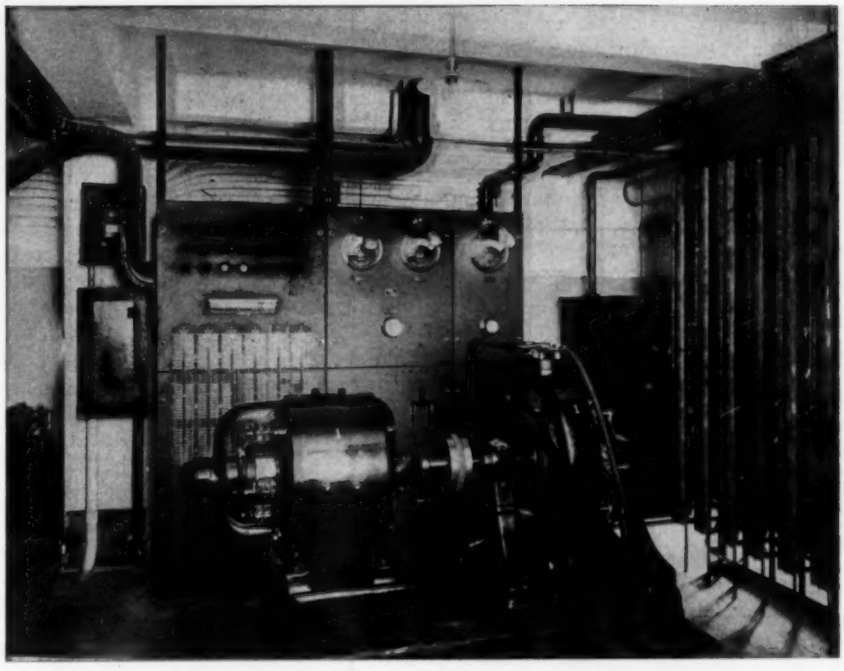
The terminal room adjoins the operating room. It contains the main and intermediate distributing frames, relay and coil racks, fuse and power panels, machines, battery and wire chief's desk.

Ordinarily it is not necessary to install an intermediate distributing frame in connection with an installation of the McAlpin type. Owing, however, to the uncertainty of the method of numbering the rooms at the time the board was designed, it was thought advisable to install a frame to make the switchboard numbering more flexible. As installed, the jack numbers in the switchboard correspond to the room numbers and thus avoid the use of designation strips in the multiple. This numbering arrangement is the same as in the central offices and greatly facilitates the operation of the board.

THE POWER PLANT.

Power is furnished from a 175-ampere charging unit in conjunction with a 15-F type storage battery having a capacity of 560 ampere hours. Ringing current is ordinarily furnished over a generator feed from the Greeley central office. A 75-watt ringing machine has been installed for emergency use.

Current for operating the telephone power plant is supplied from the hotel power system.



Terminal Room Adjoining Operating Room. Main frame, coil condenser and relay racks not shown in the picture. The battery cabinet is in back of the power switchboard. On the wall above the battery cabinet will be seen the feeder and house cables entering the terminal room.

THE WIRE CHIEF'S DESK.

A standard private branch exchange wire chief's desk is furnished for the use of the inspector in charge of the plant. This desk has the standard voltmeter testing combination and holds the card catalogue of the stations, trunks, etc. These records are kept in the same manner as the wire chief's records in a regular central office. The inspector does not leave the hotel during business hours except for emergencies.

TELEPHONE SYSTEM—THE NERVE CENTER OF THE HOTEL.

It is difficult to grasp the immensity and the completeness of the hotel. The building occupies 30,000 square feet of ground at the transportation center of Manhattan. It rises 25 stories room the street and has three sub-basements. It contains 1,500 rooms and 1,100 baths, and has a working force of approximately 1,500 persons. It can comfortably house 2,500 guests. To make the excavation for the foundation, it was necessary to blast nearly 2,000,000 cubic feet of solid rock, weighing 150,000 tons. The building contains seven miles of heating risers, mains and returns and 115 miles of electric light wiring. A total of 13,000 tons of steel were used in its construction. It cost complete $15,000,000. This is the amount Thomas Jefferson, as president of the United States, paid Napoleon in 1803 for the 875,025 square miles comprised in the Louisiana purchase.

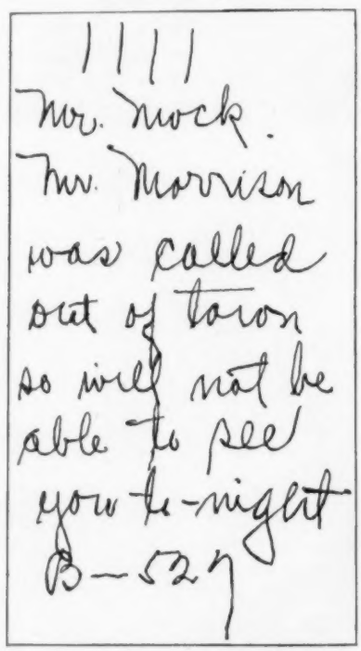
The hotel management, realizing the necessity of prompt communication for the successful operation of a hotel of this size, has had instruments installed in all of the private rooms, corridors, offices, kitchens and

other departments. In addition, it has arranged for portable instruments for service in the grill and other public rooms. Also there is a large attended public telephone station on the main floor and smaller groups of public stations on the grill floor and on the mezzanine floor.

The entire telephone installation has been designed with a view to afford adequate facilities to care efficiently and comfortably for the guests. It is the major medium of communication in the hotel, and is supplemented by the telautograph and pneumatic tube systems with which the building is equipped.

STATION EQUIPMENT.

There are at present in service 1,625 stations. Those in the guests' rooms, halls and service pantries are of the new metal flush type. They consist of an outlet box installed in the wall by the subscriber during the construction of the hotel. A frame carrying a hinged door is fastened to the outlet box. The induction coil, condenser, ringer, hook, transmitter bracket and line ter-



Telautograph Record to Hotel Guest.

minals are mounted on the inner side of the door. The outer edge of the mouthpiece on the wall type instruments projects only about 3¾ inches from the wall. In the case of the desk type instruments the gongs project only about 1¾ inches from the wall. This is the first installation on which these instruments have been used by the New York Telephone Company.

When the hotel has been completed in all its details, it is expected that there will be in service over 1,700 stations. This is a greater number of stations than in the famous town of Saratoga, which is noted for its hotels. It is as many as are in service in the kingdom of Greece, which has an area of over 15,000 square miles and a population of more than 2½ million. The installation is practically as large as the entire telephone plant of Bulgaria with an area of over 38,000 square miles and a population of 4½ million. It is larger than the plant in any one of 300 of the company's central office districts. The installation cost about $50,000.

ATTENDED PUBLIC TELEPHONE STATION.

The main public station is located on the east side of the lobby, under the mezzanine floor, near the 33rd street entrance. It consists of a standard two-position public station switchboard in an enclosure and fifteen booths. Service from the booths is obtained over two tie lines to the hotel switchboard and eighteen trunk lines to the Greeley central office.

The booths are of the folding door type and are lined with plate glass. They were installed by the hotel and are equipped with hotel sets in the standard manner.

CABLE AND WIRE PLANT.

To connect the stations to the switchboard it was necessary to install 7,184 feet of cable, ranging in size from 11 pairs to 606 pairs. These cables weigh about 24,000 pounds and contain about 522 miles of conductors. In addition to the cables, approximately 200,000 feet of inside wire and 15,000 feet of cross-connecting wire were used, thus making a total of 600 miles of telephone conductors. This is sufficient to extend two-thirds of the distance between New York and Chicago.

Elephants Respond to Air Messages

So elaborate was the scale on which the Collins Wireless Telephone Company carried on the demonstrations of its apparatus that on one occasion air messages were even sent to the Ringling Circus elephants in Madison Square Garden, New York.

This fact was sworn to by Sylvester Sullivan, publicity agent of the Ringling Circus, who was called to the stand in the Federal District Court recently to testify at the trial of Cameron Spear, Charles L. Vaughn, Archie Collins and Joseph Reall, the promoters of the Collins company.

Sullivan said that large receivers, specially constructed, were clamped to the elephants' ears and several clowns stationed on the opposite side of the arena were instructed to talk into the mouthpieces.

"The elephants jumped around in such a lively fashion," said the witness, "that Mr. Ringling thought it would be a good idea to buy one of the Collins machines to put ginger into the beasts. He also suggested that it would be mighty handy in transmitting suggestions and sometimes maledictions to the performers in the centre of the arena."

New Zealand Ships Must have Wireless

The government will shortly put into operation in New Zealand regulations making it compulsory for passenger ships to carry wireless apparatus.

The government has decided to adopt the full automatic telephone system for centers requiring new equipment, and has been calling for tenders for full equipments for Auckland, Wellington, Hamilton, Masterton, Blenheim and Oamaru. The original intention was that switchboards carrying 10,000 lines each should be installed in each of the four cities, and smaller systems in the provincial towns. Ultimately the Auckland and Wellington exchanges will be enlarged to a capacity of 15,000 lines. It is estimated that the new system will be completely installed in the two largest cities by the end of 1913. Meanwhile the pressure on the existing manual systems in Auckland and Wellington is to be relieved by the installation of small switchboards carrying 400 or 500 lines, which will be adapted for use with the present switchboards.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

EVERY man has his own particular way of doing things. If he follows rules, he does it unconsciously. The rule-abiding man never sets the world afire. You seldom hear of him. Integrity, energy and judgment are the three winning essentials. The man will be hard to hold back who is fortunately endowed with good health and the short list of basic requisites just mentioned. He has little time for the man ahead, or the man behind. He finds opportunity coming to him. He is seldom disappointed and never fooled. In these stories of "Who's Who," you have observed that men who started with the larger telephone organizations and stuck, invariably started way down on the bottom rung of the ladder. By starting there, they were obliged to look up, and by looking up they formed a splendid habit.

Gerard Swope started at the bottom, if $7.00 a week may be taken as the measure. Seven dollars a week isn't much of a magnet for the young chap of twenty-three with his degrees still fresh in mind. But it was a beginning. He was assigned to the rough work in the shops of the Western Electric Company, Chicago. He suffered no compunction of pride. He accepted the job for its seven dollars a week and there was no promise. There never is in assignments of this order. If you succeed, you will do it by performing your labor just a little bit better than the average. It is this small margin that puts callous in your hands and tears mightily at your heart strings, but young Swope didn't mind. He looked up now and then, but he didn't gaze. There was too much at stake in performing slightly better than his fellows. So the grind was maintained, day in and day out for a year. In 1896 he was transferred to the power apparatus engineering department as a designing engineer. Somebody had discovered that those degrees had written across their face "bachelor of science in electrical engineering." Possibly they meant that. At least here was opportunity seeking integrity, energy and judgment.

Two years later the sales department was needing recruits and Gerard Swope had established such confidence among his fellows that the transfer came easily.

No Initial, but Lugs of Initiate.

In the summer of 1899, Mr. Swope was sent to manage the company's sales office at St. Louis, his home town, for there he was born and there he received his early education. On his own ground he organized and was the first manager of the St. Louis branch of the Western Electric Company. He was so eminently successful during the years that followed, it was most natural that his next position included "assistant supervisor of branch houses." This was in 1905, when Chicago called him back to assume the dual title with power apparatus sales manager. This was the first time that his employer over-reached Mr. Swope's physical capacity. He isn't nearly so much in bulk as he is in brains. Either one of the two positions were more than an average man's job, but Gerard Swope never batted an eye. He was quick to discover, however, that for the company's welfare, he must relinquish some title, so he dropped the supervisor of branch houses and developed a tremendous business in the power apparatus. Mr. Swope has always believed in a world market for his product and with full power in sales for power equipment he had his competitors on the jump in short order. In two years his department had made such progress that it became one of the choicest bits of saleable property the W. E. owned. Offers for it grew so attractive that it was finally disposed of, following which Mr. Swope was promptly assigned the general sales management for the Western Electric Company in New York. As a reward of merit he was elected vice-president January this year, but he still directs the selling.

General sales manager of the Western Electric Company means a whole lot more than a mahogany desk in the center of a room smothered with a big oriental rug. It was nearly a year ago when you were given a squint at the buyer for W. E.—the man who spends a mere hundred millions a year. The seller must provide the money for the spender, and then some, and Gerard Swope—no initial, but lugs of initiate—is the best little provider you may care to know. He has no time for anything but business. He carries a portfolio with him wherever he goes. He knows who he is to see and when by referring to his

portfolio cross-index. Appointments start before breakfast and seem never to end. By the simple Swope system there is always ample time for you, but the next man must never wait. When you sell things you usually wait, but Mr. Swope doesn't do it that way. He has climbed nearly all the rungs of the W. E. ladder. There is a scant trace of gray in his hair, but there is no lack of snap to his gait. If hard work may be known as energy, there is lots of it left in Mr. Swope. He is tremendously active; covers a lot of ground in a day; fits the exalted position that has been earned inch by inch on sheer merit.

Gerard Swope was born in St. Louis, Missouri, December 1, 1872. He is a graduate of the Massachusetts Institute of Technology; member of numerous clubs and a devotee to hard work and lots of it.

A Peculiar Telephone Accident

Some short time ago the German courts had to decide on the question whether a subscriber was responsible for injuries to telephone operators caused by too rapid cranking of his magneto generator. The court decided in favor of the operator. Later a new case came before the court which was decided against the plaintiff, as the case showed an accident pure and simple which could not be avoided.

A savings bank in Schwerin has a private exchange switchboard and four trunk lines to the government telephone exchange. The bank director called up the exchange one day and a telephone operator answered, but received at the same moment such a powerful electric shock that she suffered a severe nervous shock. She had to be pensioned on account of this accident. The details of the accident are the following: On the desk of one of the bookkeepers in the bank stood an electric lamp and near it was the telephone apparatus, of the Janus type. The lamp cord was worn through at one point, so that the bare wire was not insulated and this section of cord came accidentally in contact with the metal foot of the lamp. Unfortunately the metal plug of the telephone apparatus, evidently a small desk switchboard, came in contact with this lamp base, and the high tension current of the lamp passed through the defective cord, the lamp base and the telephone plug into the telephone wire. At this moment the bank director called up the exchange, the operator came in contact with the metal parts of her switchboard plug and jack and received the shock of the lighting current. The government telephone officials used the bank for damages in the interest of the operator, claiming that criminal negligence was responsible for the accident, since the bank should have seen to it that the defective cord was replaced by a well insulated cord. But the district court, and also the court of appeals, denied judgment for the plaintiff, looking upon the matter as an accident and not a case of criminal negligence. The courts stated that the cord showed wear only in a threading of the silk insulation, and as below that there was a rubber insulation it could be taken for granted that the cord was still serviceable. The fact that the telephone stood next to the electric lamp is no cause for a favorable judgment, as the telephone company's men installed the apparatus, and found no cause for moving the telephone further away from the lamp, and as these men were experts in their line, it could not be expected of the bank officials, who knew nothing about electric apparatus, to know the danger of the close vicinity of the two instruments. Consequently there is no reason for damages and the courts decided for the defendant.—*Zeit. f. Schwachstrom.*

Telegraph and Telephone School in Berlin

The city of Berlin has one of the most complete and best equipped telegraph and telephone schools in Europe. Most other cities and countries have to take the raw material and teach them the details of telephone service. This system is, of course, expensive and troublesome and such a step as has been taken by the Prussian government in Berlin is worthy of note. The telegraphers' school had been established for some time, but the telephone school is a new institution, having only been in operation since October, 1911.

Several buildings are used for telephone school rooms, lines communicating between the different school buildings. One of these schools contains five multiple switchboards, for subscribers' lines, using the common battery system. There are also four older multiple switchboards and five students' switchboards, having instruments and equipment not connected. In order that the students be taught as practically as possible, all the switchboards are supplied with the district and exchange names used in the various districts and suburbs of Berlin. There are enough switchboards in the entire system to have each board represent a certain exchange and the students operate the telephones and use the same names and make the same connections that they will be required to make in later actual service. For example, to the switchboard representing the exchange Lützow, 267 artificial subscribers' lines have been connected, and the students must be ready to make any of these connections called for. The subscribers' numbers have been chosen in such a way, that the lines are distributed in groups of 20 over the entire multiple panel. The multiple panels on the subscribers' and B-operators' switchboards have space for 7,200 jacks. The suburban call switchboard has 18 party lines, and the operators are taught to make suburban call connections with local and also with long distance. All of the switchboards are wired so that the teaching operator can listen to conversations and correct errors whenever necessary. In order that the new operators be taught to recognize troubles on the lines, all of the lines are passed across plugs with interrupter contacts which terminate at the teachers' switchboards. Introducing a loose plug in the jacks will interrupt the current to any switchboard and thus allow disturbances to be caused artificially at any operator's place at any time. The theoretical side of telephone practice is taught in a school room equipped with a demonstrating switchboard which shows all the detailed parts. A second switchboard is connected to the telephone lines so that the actual working can be explained in practice. Wiring diagrams on blue prints, and blackboard work aid in teaching the theoretical side of exchange practice. A separate switchboard is also used for receiving of telegrams, and the operators are taught to receive telegrams by telephone and transmit them to the telegraph station. The teachers employed in this telephone school are trained telephone engineers who are in the service of the government and rank with the instructors in any technical school. The course is thoroughly practical and has given excellent results and made the service of the new operators as efficient as could be expected.

The Use of Phantom Circuits

By James Cavers

UTILIZING existing toll lines and the adaptation of new circuits to phantom working is of considerable importance, both from a service and a monetary point of view. Phantom circuits have been in use for a considerable time, but their general adoption, due to improved wiring schemes and a better understanding of working conditions, is a thing of recent years. There is still a large field for their use, not only on existing lines but in connection with new and extended circuits. When one recognizes that with the expenditure of a few dollars for good coils a circuit, perhaps of 100 miles or more in length, can be obtained, the money saving possibilities alone are sufficient to make the study of circuit conditions in any particular territory a thorough and enthusiastic one.

The name *phantom,* given to a line that is built up on another, but forming a distinct and separate talking circuit, is not a good one. The circuit so formed, whether by means of coils or condensers, has physical qualities just as pronounced as the line or lines from which it is obtained. The name, however, has come to stay, and the budding telephone man or woman and the layman will still have their fancies stirred by the designation of the circuits referred to.

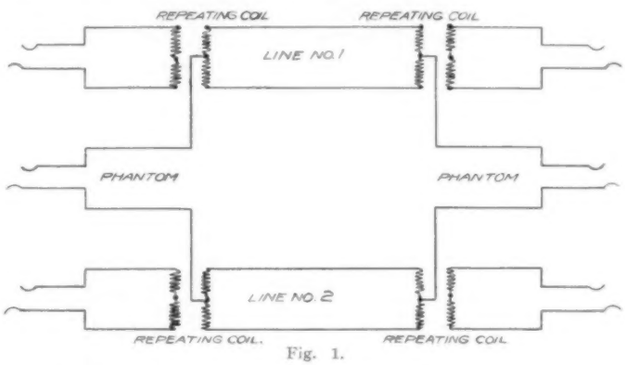
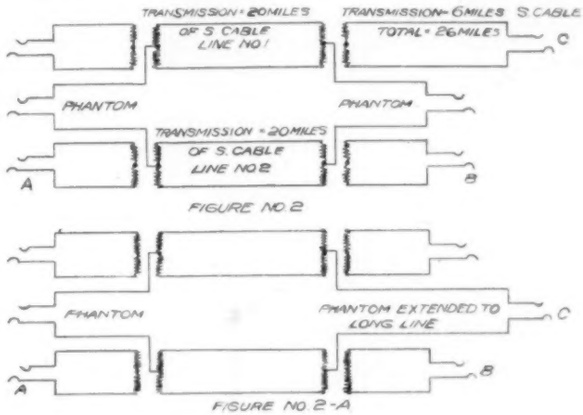


Fig. 1.

In the early days of phantom working, trouble was experienced due to severe electrostatic induction; this being caused by the lines, on which the phantom was built, not being properly transposed. This trouble has been overcome by the adoption of proper transposition methods, and there need be no fear, where such methods are applied and under ordinary conditions, that any difficulty will be met such as will tend to lower the quality of service over phantom lines.

A phantom circuit is usually built up on a line or lines by means of condensers, retardation coils or repeating coils, properly inserted in the line or lines used. The more general method in use and one which gives excellent results is the application of repeating coils for the purpose indicated. In this article this method will be used for description.

When one line only is used a grounded or single phantom circuit will be obtained. Except for short distances and under special conditions such an arrangement is not generally satisfactory. The amount of disturbance is usually high, and the phantom, if connected to a long line without a repeating coil in the connecting cord circuit, will make the whole circuit noisy, with a resultant loss in transmission value. The introduction of a repeating coil in the connecting cord circuit will also tend to impair the transmission.



It is of much importance that the lines used for phantom working be properly transposed in their relation to each other and to other lines on the same route. It is good practice, when building a new route or altering an existing one, to cut in phantom transpositions on all the lines that can be used to build phantoms on. Although it may not, at that time, be possible to use all the lines for this purpose, it is easier, and cheaper, to carry out the work then than to have to go over the same ground at a later period. It is well to note that the pole pairs can be successfully transposed for phantom working, two adjacent pairs being taken together for this purpose.

It is possible to get good service over a phantom circuit, built up on two lines not specially transposed for the work, and when, between the two pairs, there runs another telephone circuit. In such a case the introduction of other lines or phantoms would cause serious disturbances in the phantom circuit or circuits.

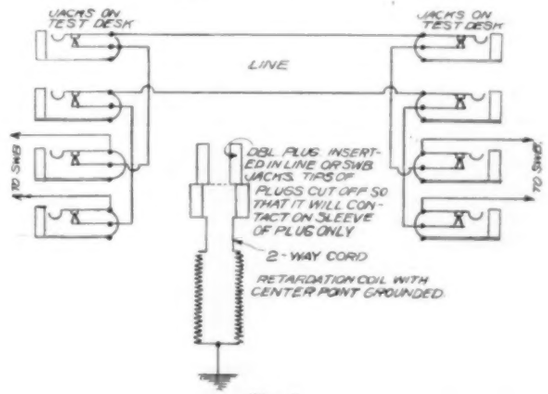

JACKS ON TEST DESK
JACKS ON TEST DESK
LINE
TO SWB
TO SWB
DBL. PLUG INSERTED IN LINE OR SWB JACKS. TIPS OF PLUGS CUT OFF SO THAT IT WILL CONTACT ON SLEEVE OF PLUG ONLY
2-WAY CORD
RETARDATION COIL WITH CENTER POINT GROUNDED

Fig. 3.

The wires used to build up phantom circuits should be of the same gauge, the same kind, and have the same length between the phantom terminals. Any pronounced

inequality will unbalance the phantom and make it noisy. It is advisable that the ohmic resistance of the lines to be used be measured and compared, although a difference of a few ohms will have no appreciable effect.

The very best type of repeating coils should be used. Their speaking qualities should be high, their ringing efficiency good and they should be properly balanced.

A phantom circuit, built up on two lines by means of repeating coils is shown in Fig. 1.

The introduction of repeating coils into the side circuits impairs their transmission efficiency to some extent. Care should therefore be taken that circuits be not used for phantom work if the coils would lower the efficiency so as to be below the standard. As a phantom circuit will have a higher transmission value than any one of the side circuits used, the former should always be connected to the longest line. Consider Fig. 2, where

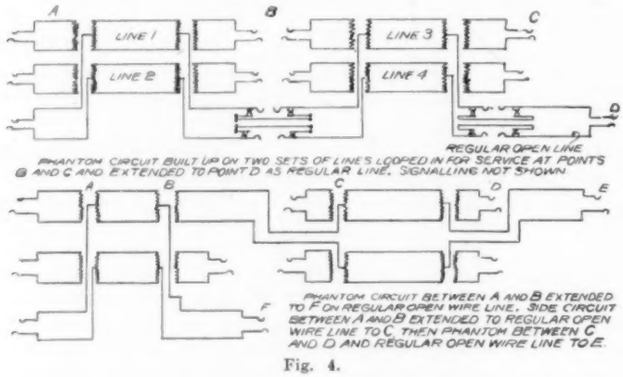

A
B
C
LINE 1
LINE 2
LINE 3
LINE 4
D
REGULAR OPEN LINE
PHANTOM CIRCUIT BUILT UP ON TWO SETS OF LINES LOOPED IN FOR SERVICE AT POINTS B AND C AND EXTENDED TO POINT D AS REGULAR LINE. SIGNALLING NOT SHOWN
A
B
C
D
E
F
PHANTOM CIRCUIT BETWEEN A AND B EXTENDED TO F ON REGULAR OPEN WIRE LINE. SIDE CIRCUIT BETWEEN A AND B EXTENDED TO REGULAR OPEN WIRE LINE TO C. THEN PHANTOM BETWEEN C AND D AND REGULAR OPEN WIRE LINE TO E.

Fig. 4.

the two side circuits shown have each, between the points used for phantom working, a transmission value equal to 20 miles of standard cable; and the first circuit, due to its being extended for a considerable distance, has, for its entire length, a transmission value of 26 miles of standard cable. The introduction of the repeating coils will, of course, make the transmission poorer but, as shown in Fig. 2-A, the phantom can be connected to the long line, thus making it a better circuit than before.

The number of repeating coils that may be placed on any one line is limited, due to their effect on transmission and the cutting down of the ringing efficiency. The latter depends not only on the number of coils equipped, but on the number of stations connected to the line and their location. No rule can be advanced to suit all cases, but a little experience of phantoms and the use of the trial and error method will, in most cases, suffice to ascertain the limits of the system as applied to the territory dealt with.

The question of transmission is all-important and should receive very special attention. The manufacturer of repeating coils should be able to state what transmission loss will accrue due to his coils being placed, in a specified manner, in a circuit. The transmission results, due to circuits being used for phantom purposes, should be studied before any other actual work is gone on with.

The effect of long stretches of cable in the side circuits is to make the phantom noisy and give cross talk. In special cases cable wires are transposes for phantom working, but these cases are few and trouble will result if cable lengths are not kept at a low figure.

Maintenance on lines used for phantom working should be of a high standard. The effect of leakage and disturbance will be specially apparent on the phantom.

In localities where trouble is experienced due to static charges from sand storms, etc., retardation coils with center point grounded, connected to the lines by means of cords and plugs as shown in Fig. 3, will effectually drain the lines affected. Such static charges, besides causing a loud noise on the lines, throw the drops at the various stations and are therefore an annoyance to the operators. It is well to note that a retardation coil, connected as above, will have no effect on the side circuits of a phantom, as the repeating coil intervenes between it and the line. In this case a retardation coil should be placed on one or both ends of the phantom, this resulting in both the side circuits being properly drained.

When a side circuit is open, grounded, or crossed with another line, the phantom will become inoperative and the connection will have to be taken down. A short circuit on a side circuit will, however, have no effect on the phantom.

Side circuits are frequently cut in at some office between their extremities, for testing purposes. Where this is done officials at these points should be warned that if any of the side circuits are opened for test the phantom working on such circuits will be put out of order.

The proper arranging of side circuits and phantoms requires study, but any labor involved will be amply repaid by the results achieved. Some combinations of circuits are shown in Fig. 4.

It is necessary, in order that proper tests be quickly made on the side circuits used, that some method be

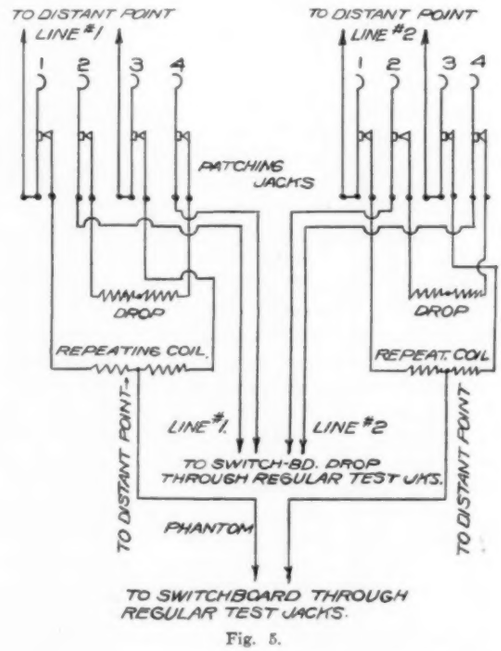


Fig. 5.

adopted for readily removing the repeating coils from the lines. This is usually done at the test panels at the different points. Two methods, devised by the writer, are shown respectively in Figs. 5 and 6. The first arrangement is such that, by the insertion of short circuited double plugs in jacks *1-2* and *3-4*, the repeating

coils are cut out and the lines connected straight through. In the second arrangement the lines and coils are connected to locking keys, the coils being connected when keys are in normal position and cut off when buttons of keys are pulled out.

It is necessary, besides the connections above referred to, to have the lines go through the regular testing jacks on the test panel, the wiring being so arranged that the tester would not plug in on the line side of any repeating coil and thus open up the phantom circuit.

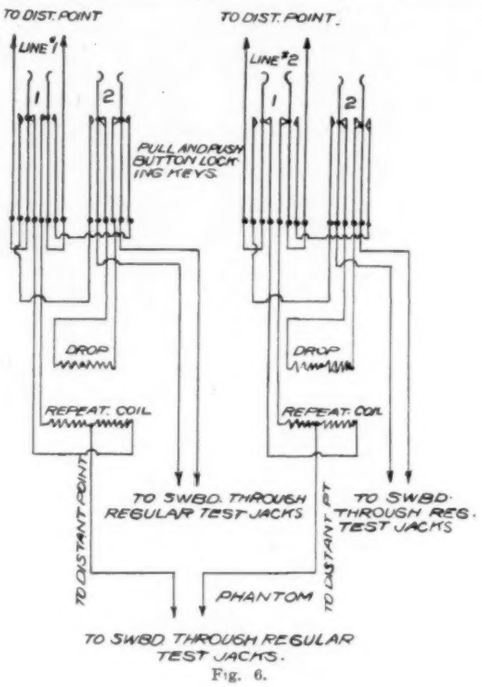


Fig. 6.

In some cases the coils are connected to the lines by means of plugs and cords. This method is quite satisfactory in many cases but trouble is sometimes caused by operators in small towns placing the plugs in the wrong jacks.

It seems hardly necessary to add further matter to that already brought forward in favor of the phantom circuit, but, in conclusion, let us bear in mind that such circuits are highly efficient, are cheap, there is practically no maintenance and they are easily obtained.

The Telephone in the Flood

The telephone has become to such an extent an integral part of our business and social life that we sometimes lose sight of the fact that it is also our greatest aid in times of emergency.

Attention was forcibly called to this fact during the recent disastrous floods in the Ohio Valley. That there were not more lives lost was due to the fact that the telephone messages of warning were swifter than the onrushing waters. With the vast network of telephone wires connecting practically every outlying district and farm of the Ohio and contributary valleys, warning messages were sent in time to enable the people to escape to the hills.

Here was evidence that the telephone has a wider and more general application than its forerunner—the telegraph. Anyone who can talk and hear can send and receive telephone messages. When the floods were at their heights, the telephone provided practically the only means of keeping the stricken districts in touch with the outside world and facilitating the work of rescue and relief. Daily papers everywhere brought out such headlines as "Governor Cox Talks to Dayton Officials Over Telephone," "Wire Chief Sticks to Post and Telephones Details of Disaster," and "Telephone Directs Rescue Parties to Danger Points."

Column after column in the newspapers bore witness to the telephone's value in the emergency which had arisen. From the very first the telephone brought a comforting sense of the nearness of relief to those in the rural districts and cities isolated by the floods.

Increasing familiarity with the telephone on the farm, in the home and in the office, has made us blind to the intricate workings of the vast machine that keeps the telephone system working, and it is only during these emergencies that attention is drawn to the never-ending warfare that the telephone people are waging with the elements. At these times the telephone is practically the only public utility that continues business. Electric lights cease to illuminate streets and buildings; as locomotives cannot swim, railroads give up the attempt to run trains; and boats take the place of street cars. But the telephone people keep their lines working. When the wires are broken at one point, they are promptly strung at another. Men in boats string cables along a bridge, one span of which is destroyed. They no sooner finish the work than the rest of the bridge comes down with a crash, taking the telephone wire with it. Thereupon improvised poles are erected, one on each side of the river, and wires are stretched between them. Service over these wires is maintained until cables can be strung across the piling of the ruined bridge. The task of keeping the main lines of communication open was not the only one that kept the telephone people busy night and day. When the man whose office upon the first floor of his establishment was under water, began to do business in the second story, the telephone people came to put in a new telephone. The young women who sat before the switchboard in many of the central offices, were carried to and from their work in row boats. They willingly worked long hours under a greatly increased strain, for in times like these the telephone is called upon to do double and triple duty.

The repair men in the Ohio and Indiana districts able to cope with the ordinary troubles, incident to maintaining telephone service needed help, of course, in this almost national catastrophe, and hundreds of men were rushed to the scene from New York, Philadelphia and many other cities. Motor boats were provisioned for extended trips into the stricken districts.

The value of the telephone was appreciated, not only by those in the devasted regions to whom it brought aid, but to the outside world to whom it brought tidings and relief from mental strain. The telephone, at one time scoffed at and derided as a scientific toy, has become man's greatest servant.

The under-secretary of posts and telephone of France paid a visit recently to Antwerp with a view to inspecting the semi-automatic telephone exchange of the Bell Telephone Company there. The visit is supposed to be connected with an intention to introduce into Paris this system, which, says the *Elek, Nachrichten,* is superior in essential technical particulars, affords great security in working, and is considerably cheaper.

The Telephone Scrap Book

DOLLAR SCRAPS.

"Scraps" suitable for this department will be paid for at the rate of one dollar each. Each scrap must have at least one illustration, for which a rough pencil sketch will suffice. Practical kinks for workers are most desired, although any original matter that is really interesting is acceptable. A kodak snap-shot with a few words of explanation may be just as satisfactory to the editors as a long article. Unused scraps will be returned, and the used ones will be paid for after publication.

How to Make a Slide-Wire Bridge

A SIMPLE slide-wire bridge may be constructed as follows, says A. E. Andrews in *Popular Mechanics*. Procure a piece of well-seasoned hard wood that is to serve as a base for the bridge, 44 inches long, 6 inches wide and ⅞ inches thick. Dress both sides of this board with a smoothing plane, round on the corners on one side, and sandpaper it until perfectly smooth. Then give the board at least three coats of shellac, allowing each coat ample time to dry. It would be best to rub the surface with a piece of very fine sandpaper after the first and second coats have thoroughly dried. If the wood used has an open grain, it should be given a coat of wood filler before being shellacked in order to give the best results.

The electrical connections on the bridge should be of low resistance, so that they will introduce only a very small error in the measurements, and for this reason must be made of a material having a rather low resistance and should have a large cross section. Obtain a piece of brass or copper, approximately ⅛ inch in thickness, ½ inch wide and about 48 inches long, also ten back-connected brass binding posts similar to the one shown in Fig. 2. Cut from the strip of brass or copper a piece 12 inches long. Drill three holes in this piece, one in each end and one in the center, as shown in Fig. 3, to be used in mounting three binding posts. Drill two other holes, *A* and *B*, to be used in mounting the strip on the wooden base. Cut off two other pieces 13 inches long. File away part of one end of each of these pieces as shown in Fig. 4. Drill a hole for a binding post in the end opposite the one filed; and drill two holes, *C* and *D*, in each piece to be used in mounting. Cut off two other pieces 3¼ inches long. File one end of each of these pieces as shown in Fig. 5, so that they will fit into the notch cut in the two pieces just finished. Drill a hole *E* in the end of each of these pieces, opposite the end in which the notch is cut, and tap it to take a small machine screw. Hole *F* is to be used in mounting the strip upon the base, and a binding post should be mounted at the hole *G*. Cut off two other pieces ¾ inch long, and drill a hole in each of them as shown in Fig. 7. These holes should be large enough to allow the screws in hole *E*, Fig. 5, to pass through them. Now cut a very small groove with the corner of a file, across the end of the 3¼-inch pieces on the upper side. The location of this groove is shown by the dotted line *H*, in Fig. 5. A small groove should also be cut in the two small pieces, as shown by the dotted line in Fig. 7.

Now obtain a good meter stick and mount it on the wooden base with several flat-headed brass screws, counter-sunk so that their heads are level with the surface of the stick. Take the two 3¼-inch strips, or end connecting strips, and bend them at the dotted lines *J*, Fig. 5, forming two pieces similar to that shown in Fig. 6. The dimension *K* in Fig. 6 should be equal to the thickness of the meter stick.

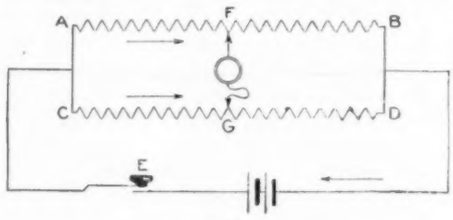
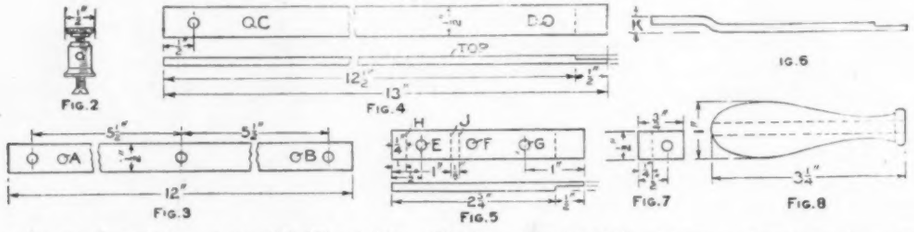


Fig. 1
Diagram of Two Unequal Resistances, Which Are Connected in Series with a Battery.

The two 13-inch pieces (Fig. 4) should now be soldered to the 3¼-inch pieces (Fig. 5), so as to form two right-angled pieces as shown by *L* and *M* in Fig. 9. These should now be mounted on the base by means of round-headed screws as shown in Fig. 9. The grooves



Details of the Parts for the Construction of the Slide-Wire Bridge. The Parts May Be Made of Brass or Copper Cut to the Dimensions Given.

H should be opposite the centers of the ends of the meter stick. Then mount the 12-inch or center connecting strip so that the gaps between its ends and the ends of the corner strips are equal in length.

The slide wire itself should be made from a piece of German silver or manganin wire, as the resistance of such a wire is greater than that of copper wire of equal dimensions and it will stand more mechanical abuse than the copper wire will. There will be required about 42 inches of wire and it should be about No. 22 gauge without any insulation. The wire can be clamped in position on top of the meter stick, and the bridge is com-

plete with the exception of a sliding contact for connecting the galvanometer to the slide wire.

A very simple sliding contact can be made by mounting a piece of brass on a small wooden handle, the electrical connection to the piece of brass being made by means of a small binding post attached to it. The piece of brass should have its edge sharpened so that it will make contact with a definite point on the slide wire. The

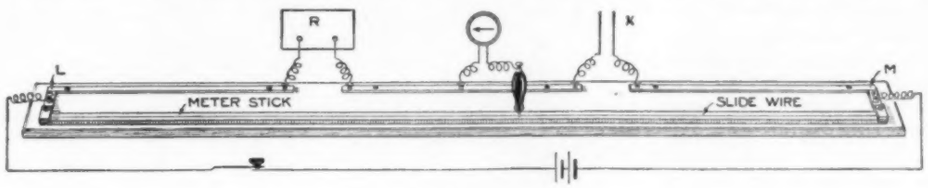


FIG 9
The Parts as They Are Attached to the Base with the Meter Stick and Slide Wire. Connections Are Shown for Placing the Unknown Resistance in a Circuit with a Known Resistance to Obtain Its Value.

following description of how to build a simple contact may be of value to some readers. Cut out a round wooden handle similar to that shown in Fig. 8. Drill a ¼-inch hole through this handle lengthwise. Obtain a piece of ¼-inch round brass rod, about 1¼ inch longer than the handle. Mount a small binding post on one end of this brass rod, then shove the other end through the hole in the handle until the base of the binding post is even with the large end of the handle and fasten it in place. File the projecting end of the brass rod so that it is wedge-shaped, and the contact is complete.

Condenser Shunt to Telephone in Wireless

IN practically all systems of wireless telegraphy the telephone receiver has superseded all other forms of reception, and it is, therefore, a matter of importance to examine the conditions under which the telephone is employed, in order to determine the most advantageous relations between the constants of the various parts of the circuit, according to H. Smith in a paper before the University of Durham Physical Society, England.

It has been found for the telephones used in practice that the best results are obtained when the telephone is shunted with a capacity. The best value of the capacity depends, among other things, on the telephone, and the practical rule has been that the greater the resistance of the telephone the less the value of the capacity to give the loudest sound. It is some-

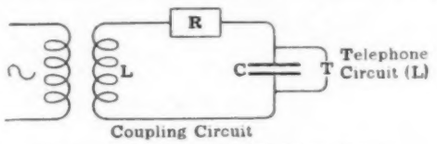


Fig. 1. Arrangement of Receiving Circuit.

times stated that the function of the capacity is to form an easy path to the oscillations past the telephone whose inductance when introduced into the oscillating circuit would otherwise seriously enfeeble the current strength. That this explanation is insufficient is clear from the fact that there is an optimum value of the capacity. It was with the object of affording an explanation of this phenomenon that the following work was undertaken.

Fig. 1 shows a very usual method for coupling the receiving circuit with the antenna. The adjustable condenser C_1, made use of only under certain circumstances, allows of tuning in the receiving circuit and is generally very much smaller than the block condenser, C, used as shunt to the telephone T. If C is increased while the messages are being received the intensity in the telephone increases at first, followed by a deadening and lowering of the note, due, one might imagine, to the suppression of the higher harmonics. As the condenser C and the inductance of the telephone form an oscillatory circuit, it is reasonable to expect resonance with some of the harmonics. If this be so, the best value of the capacity C will be when the telephone circuit is in resonance with the more pronounced of these harmonics. Moreover, the addition of an inductionless resistance, if of sufficient value, to the telephone circuit should effectually pre-

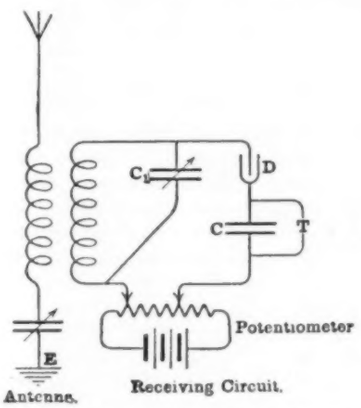


Fig. 2. Experimental Receiving Circuit.

vent all resonance and no rise in intensity in the telephone would be observed. Experimenting with the arrangement shown in Fig. 2, the author found this actually to be the case; indeed, with one telephone tested, whose resistance was large compared with its inductance (2,000 ohms 0.02 henry respectively), there was a continuous falling-off in intensity from the moment condenser C was put across it without any further addition of resistance.

The current through the telephone is, of course, intermittent, occurring every time the detector D is traversed by oscillations picked up from the antenna. We may, however, regard it as an alternating current whose frequency is that of the break in the primary current at the sending station, and which has superposed on it a direct current, and contains in it also a large number of harmonics.

The following arrangement was adopted as sufficiently well reproducing the condition of things in the receiving circuit: L represents the inductance of the receiving circuit. The seat of the E. M. F., as before, is the circuit LC, but is produced by coupling

with an alternating current instead of being taken from a potentiometer. With such an arrangement as this the current due to any particular harmonic through the telephone is a maximum when

$$C=\frac{L}{R^2+w^2L^2}+\frac{L_1}{R_1^2+w^2L_1^2}.$$

Here L and R are respectively the inductance and resistance of the coupling-circuit LC, and L_1 *and* R_1 the inductance and resistance of the telephone circuit consisting of the telephone and the condenser C, and $w=2\pi\times$ frequency of the harmonic.

When R_1 is very large and R small, very beautiful resonance in the coupling circuit with the harmonics in the alternating supply is obtained. The intensity of the sound in the telephone is a series of maxima, each maximum giving a different note whose frequency is the same as that of the harmonic. In the case of wireless telegraphy the resistance R is in general great, due to the detector; and from the symmetry of the expression given for the value of C, if R_1 were small this time we should expect to have the same phenomena in the telephone. R_1, however, is not small, and instead of hearing several notes at different maxima, the intensity rises to one maximum only, not very sharply defined.

With three different telephones the following results were obtained:

Telephone's resistance	Telephone's inductance	Capacity to produce maximum	Frequency of telephone circuit
3.75 ohms	4 millihenries	4.5 mfd.	1,190
130 ohms	48 millihenries	0.3 mfd.	1,340
157 ohms	100 millihenries	0.2 mfd.	1,130

We see from this that when the maximum occurs the frequency of the telephonic circuit is very approximately the same for very different telephones. No very good agreement can be expected, as not only is the inductance of a telephone difficult to measure accurately, owing to its resistance, but the optimum value of the capacity is not very easy to note. The constants of the coupling circuit LC were: L=158 millihenries and R=4,000 ohms.

To study better the effects of resonance in the telephone circuit the following arrangement was adopted: Circuit A (*see* Fig. 3) is brought into resonance with any desired harmonic by varying C_1 and listening in the telephone T_1 (R_1 must be large—say 10,000 ohms) till the corresponding note is a maximum. Circuit B is now coupled with A, and C varied till the harmonic gives a maximum in the telephone T. In this way the following results were obtained:

Harmonic	3rd	15th	....	....
Frequency of harmonic	240	1,200	....	....
Resistance of telephone T.....(ohms)	157	3.75	130	157
Inductance of telephone T.....(mh.)	100	4	48	100
Capacity to give maximum.....(mfd.)	1*	4.5	0.35	0.2
Frequency of telephone circuit.....	437	1,190	1,230	1,130

The discrepancy between the frequency of the harmonic and that of the telephone circuit (calculated by taking into account its resistance, which is effective in low frequencies) in the first case is very great. It is due partly to the fact that it was very difficult to decide when the maximum occurred, but chiefly to the existence of the higher harmonics, as the fifth and seventh, which were still quite strong. To seperate mentally the effect of each note was impossible.

In the case of the other telephones the author was unable to determine the optimum capacity at all, the change in intensity was so imperceptible, but for the small inductance telephone it was certainly greater than 12 mfd. With the 15th harmonic it was different, as it was very much more powerful than any of its neighbors when separated in the way given above, and fair agreement between its frequency and that of the telephone circuit was obtained.

It would appear, then, that when a telephone is shunted with a condenser, the maximum intensity in the sound which occurs, is due to resonance in the telephonic circuit with the various harmonics, the maximum being in reality a compromise of several maxima due to several harmonics. In the case worked

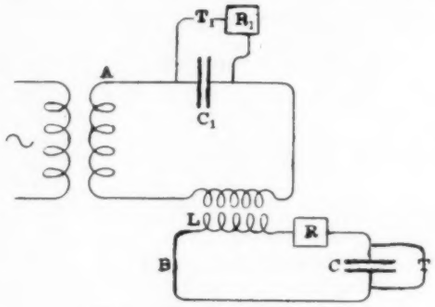


Fig. 3. Experimental Circuit.

out above, it occurred in the region of the maximum produced by the 15th harmonic, which was a particularly prominent one.

Applying these results to the case of the telephone used as a receiver in wireless telegraphy, we see that the value of the capacity used as a shunt to the telephone, which produces the maximum intensity in the telephone, is not independent of the break in the primary current at the sending station; that in the general case, where circuits in parallel with the telephone have a large resistance this maximum is due to resonance in the telephone circuit alone, and that the "harmonics" in the break, and not the frequency of the break itself, may be the most important factor in determining the value of the capacity to produce the best effect for any one telephone.

Changes Fire Escape; It Tripped Girls

An exit test conducted by a local telephone company in Denver developed that the high heeled shoes worn by the girls made it difficult for them to travel down the fire escapes, as the bottoms of the heels, being so small, caught in the holes in the iron platforms and steps.

Rather than require the girls to wear sensible shoes the company will build an inclosed tower fire escape, which is the easiest way to overcome the difficulty, and the projected tower is the best sort of a fire escape.

Yet an opportunity to object to high heels is lost, and if a certain telegraph company in New York can require its women employees to wear long sleeves it would seem possible for the Denver concern to require short, broad heels.

Rural Telephone Brings Prosperity

The use of the telephone by farmers generally has contributed in a large measure to the unprecedented prosperity on farms. Not only does the telephone bring him the weather forecast and the market reports, but it enables him to talk to neighbors and town merchants and transact business with little loss of time from farm work.

How the Service Association Works

By Frank L. Eldridge

MUCH comment is heard throughout the independent telephone field about the new service organization known as the Telephone Service Association, the formation of which took place at a meeting of several connecting companies at the Hotel La Salle, Chicago, Illinois, on October 16, 1912.

At the time this meeting was called, no thought was given to such an association, and the companies gathered merely for the purpose of discussing the betterment of service conditions.

By a natural process of evolution and not as the direct suggestion of any individual, a vague plan for an association which should devote its energies entirely to the betterment of service conditions throughout the field began to appear. The by-laws at that time were, of course, hastily drawn and were subject to and deserved amendment in several important particulars.

Frank L. Eldridge, Manager Telephone Service Association.

To further map out the plans of the association, another meeting of the interested companies was held at the Hotel La Salle, Chicago, on November 12, 1912, at which time the by-laws were endorsed and the organization fairly launched.

The officers elected at the first meeting were: President, J. W. Callahan, general manager Illinois Telephone and Telegraph Company, Chicago, Ill.; Vice-president, C. E. Tarte, general manager Citizens' Telephone Company, Grand Rapids, Mich.; Secretary-treasurer, L. J. Wylie, manager Decatur Home Telephone Company, Decatur, Ill.

The executive committee is composed of J. W. Callahan; E. E. Daicey, general manager South Bend Home Telephone Company, South Bend, Ind.; L. C. Griffitts, general manager Inter-State Independent Telephone and Telegraph Company, Aurora, Ill.; W. S. Vivian, secretary and treasurer Michigan Independent Telephone and Traffic Association, Grand Rapids, Mich.; W. S. Fisher, general manager Eastern Illinois Telephone and Telegraph Company, Kankakee, Ill.; H. B. Gilmore, Illinois Toll Clearing Company, Springfield, Ill.; Thomas Ainsworth, manager Bloomington-Kinloch Telephone Company, Bloomington, Ill.; and C. E. Tarte.

In carrying out the fundamental ideas of the new association, which is *service*, three committees were appointed, viz., Engineering, Traffic, and Commercial. These are composed of the following individuals:

Engineering Committee—B. C. Groh, chief engineer, Illinois Telephone and Telegraph Company, Chicago, Ill.; H. B. Crandall, chief engineer, Inter-State Independent Telephone and Telegraph Company, Aurora, Ill.; R. L. Barry, general superintendent, Tri-State Telephone and Telegraph Company, Minneapolis, Minn.; A. L. Stadermann, chief engineer, Terre Haute Home Telephone Company, Paris, Illinois Company and Kinlock Bloomington Company, Bloomington, Ill.

Commercial Committee—C. L. Fisher, chairman, president Automatic Telephone Company, Pontiac, Ill.; E. E. Daicey, and L. C. Griffitts.

Traffic Committee—W. S. Vivian; John F. Casey, traffic manager, Kinloch Telephone Company, St. Louis, Mo.; Walter J. Uhl, general manager, Home Telephone Company, Logansport, Ind.

It is proposed by the Telephone Service Association to afford its members, through these committees, expert advice along traffic, engineering and commercial lines, absolutely without charge aside from the dues. This advice, as may be seen from the personnel of the various committees, will be of the highest possible grade—advice such as is commonly at the command only of the large companies who can afford to hire specialists in the various lines. More than that, where necessary, it will be the result of the joint council of several specialists in each line and not one alone.

The association, therefore, plans to be of the greatest aid to the smaller companies. That is, the small company will receive benefits equal to those obtained by the large one, something which has never before been attempted in the history of the telephone business, and the intrinsic worth of which must be instantly apparent to every one.

For instance, an engineering problem arises in the construction of a small toll line. It is entirely beyond the range of the experience of the manager and he would ordinarily be at a loss as to how to deal with it. If he is a member of the Service Association, he can communicate his difficulty to the manager of the association, who will refer it to the chairman of the committee involved for immediate solution.

Traffic questions will be dealt with in the same manner, as will also those affecting the commercial end of the business. All three committees, moreover, will, from time to time, issue practical helpful suggestions along general lines for the benefit of all the members.

The first step of importance, which has already been taken, is the compilation of a modern set of operating rules together with a code for the use of long distance operators. It is held by the association, and rightly, that uniform operating rules are of first importance in the accomplishment of speedy and profitable toll operation.

These rules have been adopted by the various companies and are effective in many localities. The association has many members who operate several small exchanges and they are using these operating rules and code with excellent results. In some instances these companies are holding operators' schools and are having examinations and other features which will assist in building up their toll business.

In compiling these rules, one thought especially was kept in mind, that of avoiding technical terms. It is known that the rules of some companies are so technical that it is difficult for the operators in the smaller offices to understand them. The association has made every effort to use terms which can be readily understood by operators in all offices.

With proper encouragement from the various companies, there is every reason to believe that the Service Association will meet with the desired success and that it will ultimately result in promoting unity among the connecting companies, which will be of tremendous value to the industry.

The association proposes to work for a standardization of every branch of the telephone business hitherto unknown. It is proposed to work with, and not in opposition to, any district, state or national association. It seeks the formal endorsement and active aid of all of these.

The Engineering Committee, which is at the command of the members at any time to answer inquiries in connection with plant conditions that may come up, is a feature that alone is worth many times the amount of the dues which are paid into the association.

In the very near future, papers will be sent out to the members with helpful suggestions by the various engineers, also special bulletins that will be beneficial to every company. These features are only part of the splendid work that will be done and it is felt that every operating company in the country should become a member of the organization and assist in getting new members at every possible opportunity.

In addition to the features mentioned, the manager will be in the field the greater part of the time to take up complaints of poor service which may arise, with a view of bringing the companies together and remedying the poor conditions that may exist as well as endeavoring to bring about the fullest co-operation between all connecting companies.

As the convention of the National Independent Telephone Association was held in Chicago on February 18, 19 and 20, a meeting of the Service Association was called for Monday, February 17, in the office of the president, J. W. Callahan, for the purpose of discussing any matters of interest to the association that might be brought before the national convention. Another reason for calling this meeting was to bring up the question of changing the name of the association. It developed that a large number of companies outside the territory which the association proposed to cover, had become greatly interested in the organization but felt that they were not welcome as members on account of the association confining its work to the central states. At this meeting, this question was taken up and it was voted to change the name of the association from the "Central States Telephone Service Association" to that of the "Telephone Service Association," which now makes every company in the United States and Canada eligible for membership.

This association had charge of the technical conference at the national convention and held its audience for practically the whole of one day with the many important discussions and interesting papers which were read. There were also illustrated lectures by manufacturers and motion pictures of the work being done in the building of the Panama Canal. It was felt by practically every one who attended the convention that the program of the Service Association was a complete success and that this is one of the greatest movements ever started in the independent telephone field.

On April 7, a permanent office was secured by the association, arrangements being made to share the offices of the National Independent Telephone Association, in the McCormick building, Chicago, each association to be maintained as a separate organization.

The dues have been placed on the following basis: A minimum fee of $5.00 per annum for companies with five hundred units or less (a unit being one telephone or one circuit mile of toll line); for companies with over five hundred units, the fee to be one cent per unit per annum.

This organization is maintained solely for the betterment of service conditions and assisting the operating companies, and it is sincerely hoped that every independent and mutual company in the country not now a member will at once write *F. L. Eldridge, Manager Telephone Service Association, 1404 McCormick Bldg., Chicago, Ill.*, for further information or send in an application for membership.

Eastern Independent Companies Organize

Independent telephone companies of eastern Pennsylvania, twenty-one of them, are responsible for the birth of the "Eastern Pennsylvania Independent Telephone Association," which was started out in life on April 16, 1913, at Harrisburg, Pa., provided with a by-laws of seventeen articles, a number of efficient committees, a lengthy series of resolutions and a roster of fifty names.

It was H. E. Bradley, of Philadelphia and the Eastern Traffic Association, and C. M. Thompson, of the Kellogg Switchboard and Supply Company, who issued a circular letter which brought representatives of the twenty-one independent companies together in the main auditorium of the Board of Trade building in Harrisburg. Mr. Bradley was made temporary chairman of the work which resulted in the founding of the new association and Cameron L. Baer was named temporary secretary. The constitution and by-laws of the Western Pennsylvania Independent Telephone Association were read by Mr. Bradley and adopted by the new body after a brief discussion of them and a changing of the western limits of the association, which, in the eastern body's constitution, is represented by a line drawn north and south through the city of Altoona.

Addresses were made by J. Walter Barnes, of Fairmount, W. Va., president of the United Independent Telephone Association; B. G. Hubbell, of Buffalo, N. Y., president of the Federal Telegraph and Telephone Company; John H. Wright, of Meadville, Pa., and W. B. McCaleb, receiver of the United Telegraph and Telephone Company. The following were unanimously elected officers of the association: J. F. Stockwell, of the Keystone Telephone Company, Philadelphia, Pa., president; M. E. Reeder, Muncy Creek Telephone Company, Hughesville, Pa., first vice-president; J. F. Ogden, of the Merchants' Telephone Company, Tunkhannock, Pa., second vice-president, and O. K. Kines, of the Cumberland Valley Telephone Company, Harrisburg, Pa., secretary-treasurer.

The next quarterly meeting of the association will be held in July, the place and date of holding being left in the hands of the executive committee.

The president of the State of Sao Paulo, Brazil, has signed a decree granting the petition of the Sociedade Auto Transporte Parahybunense for establishing a telephone line between the towns of Parahybuna and Sao Jose dos Campos.

Experiences With the First Telephones

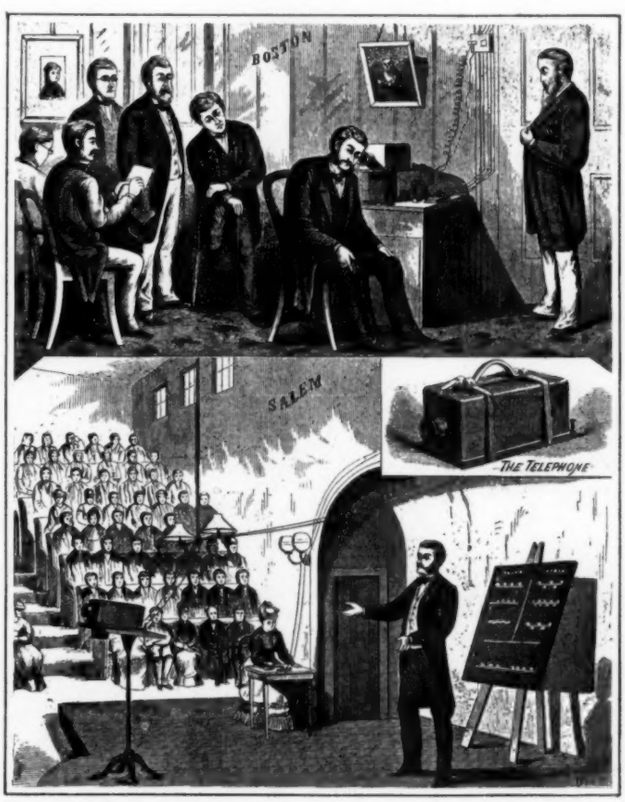
By Thomas A. Watson

Paper read before the Telephone Pioneers of America.

MY recollections of Dr. Bell's early telephone experiences are only those of a boy, for I was about twenty years old when I first met Dr. Bell. But they are still very vivid, as boyhood's recollections usually are. Those lectures delivered by Dr. Bell in the spring and early summer of 1877 really had a most important effect upon the present development of the telephone. At that time there was a tremendous need for cash. We had just been bitterly disappointed, we four who composed the telephone business at that time—Mr. Hubbard, Mr. Sanders, Dr. Bell, and a boy by the name of Watson. We had just received a terrible blow: The Western Union Telegraph Company had refused our offer to sell all the Bell patents for $100,000, and we were very much depressed over it. Just about that time Dr. Bell needed money, more, I think, than he ever needed it before in his life. He wanted to get married. The need for money was so great that some of the ladies prominently connected with the original four, insisted that telephones be made and sold, by the thousands—as many as could be put out and as quickly as possible. This would have meant the flooding of the country at that time with very imperfect telephones and also would have blocked the plan of leasing them that has resulted in the present unity and universality of the telephone service.

I doubt if that idea had been carried out, of selling these early telephones, whether it would have been possible for the exchange business to have been so thoroughly controlled by the original company as it has been. The lecture course that Dr. Bell gave during the spring and summer did away with the necessity of selling those telephones. We both lived in Salem, a coincidence merely, and in Salem there was a scientific association known as the Essex Institute, an old institution that was interested in botany, bugs, archeology, antiquities, etc. It took an intense interest in Dr. Bell's experiments and invited him in February, 1877, to talk to the members of the society about the telephone and to give them an exhibition of its powers.

This was arranged. We engaged a telegraph wire of the Atlantic and Pacific Telegraph Company to connect our laboratory in Boston at No. 5 Exeter Place with Lyceum Hall. At the Lyceum end there were two or three of those old-fashioned box telephones about fourteen or fifteen inches long and eight inches square with an enormous horseshoe magnet inside of it. At my end I had a cornet player, an organ arranged so that each reed made and broke the circuit each time a key was depressed, as loud a speaking telephone as we had at that time, and, lastly, my own voice to illustrate his lecture course. Dr. Bell discussed his theories and described his experiments, calling on me occasionally, who had to be constantly listening, to illustrate from my end of the wire what he said.



This Wood Cut, Reproduced from the *Scientific American* of March 31, 1877, Shows Prof. A. Graham Bell Lecturing to an Audience at Salem.

My first illustration was usually with the organ. I would play one or two tunes on that. As that produced a powerful intermittent current, it came out very loudly at the receiving telephone at the hall end even though it was sixteen miles away; then we had some cornet playing, and, although I say it—who should not—the great feature of the evening was the sentences I ejaculated through the instrument. My illustrations were usually about the same thing. They were such sentences as, "How do you do?" uttered in the stentorian voice I had developed at that time. They told me the sound came out at the receiving end, no matter how carefully I articulated it at my end, as something like "hoo, hoo, hoo;" but the rhythm was sufficient to make the audience think they heard the words perfectly; I would shout them other sentences such as "Good evening; it is a pleasant evening." "What do you think of the telephone?" etc. And then came my songs. I couldn't sing, but I had to, for they couldn't get another voice that could make the old box ring as mine did at that time. My repertoire consisted of "Yankee Doodle," "Pull for the Shore" (it was in the Moody and Sankey times), "Hold the Fort," "Auld Lang Syne," and for sentiment, "Do Not Trust Him, Gentle Lady." I remember once, at one of Dr. Bell's lectures, I branched out and added to my repertoire, "Nearer My God to Thee," but I did it but once, for Mrs. Hubbard gave me an awful scolding the next day and I cut that out of my repertoire. After the lectures, the distinguished citizens of the town were invited to speak to Mr. Watson at the other end of the line, and there were reporters to record every word that was said. I remember very vividly how diffident distinguished citizens suddenly became when they were asked to talk through the telephone. One

of our leading legal lights of Boston, who certainly should have been able to talk, when asked to speak through the telephone, gasped and all he could think of to say was, "Rig-a-jig, jig, and away we go."

That first lecture was free to the Essex Institute, but it was so successful and attracted so much attention in the newspapers all over the country, that it was repeated in Salem to an audience of five hundred that packed the little Lyceum Hall. Its success created a demand from other places. Dr. Bell saw that there was a chance to get an income, for a short time at any rate, out of the lectures, and arrangement was at once made for quite a large number of them. The first one after the second Salem lecture was at Providence, April 8th, to two thousand people who came there to hear the telephone talk. Doesn't it seem strange that such a common thing as the telephone is today would have attracted two thousand people to hear it? The arrangements were very much the same as in Salem, only we had in addition a brass band of five pieces. When it played in that little laboratory of ours, I don't think I ever heard anything quite so loud in my life. It came out at the lecture hall very well, but they all said not nearly as well as Watson's singing. After that, a course of lectures was arranged in Boston. On the request sent to Dr. Bell for that course of lectures, were the names of Oliver Wendell Holmes, Henry W. Longfellow and many other well-known men. The first of these three lectures were illustrated from the laboratory, only about half a mile away from the hall; the second from Somerville; I can't remember where I was stationed for the third lecture, but it was somewhere within ten miles. The talk and the illustrations were very much the same as they were in the Salem and Providence lectures. After the Boston lectures came three lectures in New York. Prof. Bell was anxious to transmit his illustrations from Boston for at least one of the lectures in New York. To see if it was possible, a preliminary test was arranged over an Atlantic and Pacific wire connected from our laboratory in Boston to the Atlantic and Pacific building in New York. Dr. Bell came on here, and I had charge of the test at the laboratory end.

That recollection is extremely vivid in my mind because it took place in very hot weather. Our laboratory was in the upper floor of a boarding house, not an expensive boarding house either, I can assure you. The house was full of boarders, and as we had disturbed them quite seriously by shouting and talking and all sorts of noisy experiments, we were for that and other good and sufficient reasons not on good terms with the landlady. So I realized that as I had to do the shouting of my life that night, I must muffle the noise. I took the blankets off of my bed and Dr. Bell's and arranged a sort of a tent over my big telephone with five thicknesses of blanket. When I got the signal from Dr. Bell in New York, that he was ready to hear from me, I crawled in under my blanket tent and for two mortal hours I shouted to him. I needed no Turkish bath that night.

The next morning I asked the landlady rather timidly if I had disturbed the boarders during the night. They hadn't heard a sound. So the experiment was a success, like many others. In connection with one of the New York lectures I got into a very bad scrape. Of course, the singing that would do for Boston wouldn't do for a New York audience. So they engaged a professional singer, a negro, a big man with as superb a baritone voice as I ever heard. The first lecture was illustrated from New Brunswick, on the Pennsylvania railroad. I went down there in the afternoon and found the negro ready to do his part of the work. I had the rest of my instruments, cornet, organ, etc., and my voice, which was always with me. I rehearsed him a little and told him, when he sang, to put his lips into that mouthpiece as tight as he could and to sing for all he was worth. He didn't like the sound of his own voice when it was so muffled, and I was a little bit anxious about it. But he promised me that he would do just what I wanted him to do that evening. I went to supper and at half past seven I went back there. The young lady operator had invited six or eight of her girl friends to witness that affair at her end of the line. It was clearly my duty to make that negro sing, and so I insisted on his crawling into that mouthpiece when Dr. Bell called for the singing. I held the telephone up to his mouth and chased him half way across the room to keep his mouth close to it, but he backed away and wouldn't sing nearer than an inch. I knew perfectly well what was going to happen, and when I listened after he got through his song, sure enough Dr. Bell said, "The audience couldn't hear a sound. Mr. Watson, you sing." Twenty years old and the most bashful boy you ever saw, but there was no help for it, I had to sing. Those girls looked solemn; I never blamed them, but I sang my whole repertoire and I could hear them applauding in New York. My baritone singer looked at me with disgust and said:

"Is that what you wanted?"

I said "Yes."

"Well," he said, "Boss, I couldn't do that."

Then he left.

One of our troubles in those lectures was that the telegraph wires in those days were not nearly as good as they are today. I doubt if we ever used a larger wire than No. 8, galvanized, and I doubt if they knew how to solder their joints. The wires themselves were rusted badly. After the first lecture or two, the telegraph operators all along the line found out that their relays would hum, when I was sending the intermittent current with the organ; every station on the line would cut in its relay. As our telephones were not adapted to work against any such retardation as that, we had trouble. One night Dr. Bell lectured in Lawrence, Mass., and I tried to give them the usual program, but not one sound could I get through because half a dozen stations cut in along the line.

Those telephone lectures created a tremendous interest. I am always surprised when I think how intense and widespread that interest was. There were many applications for lectures, so many that Dr. Bell had to employ a special agent to look after the business. The man that he chose was a young newspaper reporter named Frederick Gower, the editor of the *Providence Press*, I think. As Mr. Gower was a man who loved to appear before the public and who lectured himself, occasionally, a dual lecture was arranged, I think in Hartford and New Haven. Dr. Bell lectured in one place and Mr. Gower in another; I, in between, at Middletown, furnished simultaneously for both lectures the usual illustrations, organ, cornet, voice, etc. Then the commercial demand for telephones took me away from the lectures and Mr. Gower got others to do the illustrating. At about that time, the day of Dr. Bell's marriage approached and he gave up lecturing, leaving the business in the hands of Mr. Gower, who carried it on a while

longer. Soon after, Mr. Bell was married and went to England and my time became entirely absorbed by the commercial development of the telephone and the auxiliary apparatus. Mr. Gower had a contract for the exclusive use of the telephone in New England, but he was not handling the business very well, and one day Mr. Gardiner Hubbard asked me if I had any suggestion to make as to how he could get rid of Mr. Gower's contract. I suggested that he offer Mr. Gower the exclusive right to lecture on the telephone for the whole United States if he would give up his contract, and sure enough, Gower made the exchange. I think that gives one a good idea of the size of the telephone business at that time when a man with a contract for the whole of New England would give up that contract, worth today many millions of dollars, for the right to lecture on the telephone, a right that could not be conferred, anyway!

This course of lectures not only made possible Dr. Bell's marriage at that time, but it attracted capital to the telephone business and stimulated the commercial demand tremendously, and, more important than all, I believe it was a most important factor in determining the leasing of telephones instead of selling them outright, Mr. Gardiner Hubbard's plan, which made possible the uniformity of the Bell system today.

European Telephone Development

By Fred W. Scholz

EFFICIENCY OF DIFFERENT TELEPHONE SYSTEMS.

WE read a good deal about the efficiency of the different telephone systems, but rarely see the detailed mathematical computations that go with the statements and show where the author obtains his conclusions. As a rule only general statements are made, and the telephone engineer is obliged either to take them at their value or else to try the experiments in his own exchange, which, at best, is a time robbing and severe task. For this reason it is encouraging to note that one German engineer has given detailed figures on operating results on which he bases his conclusions, and the following article is taken almost verbatim from a recent number of *Elektrotechnische Zeitschrift*.

To determine the efficiency of the semi-automatic system and that of the other systems, we must consider three factors: 1. The number of connections made. 2. The efficiency of the working force (telephone operators) expressed by *alpha*. 3. The waiting time for the subscriber. To make these three factors a little clearer it may be said that under the first one, i. e., the connections, we mean connections between two subscribers, also inquiries of the operators where the second subscriber's lines are busy. The efficiency factor *alpha* is the relation between the sum of all the time periods needed to make all required movements and connections and the total working time of the operating force or agents. The waiting periods are figured to begin at the moment when the subscriber lifts his receiver to the time when the operator answers.

Johannsen, n his book "Telephone Practice in Large Cities," brought out the close relation between these factors, and called attention to the fact that it is a mistake to compare the total number of connections made within a certain time, without using the *alpha* and the waiting time units. His definition of the *alpha* differs somewhat from the above, in that he takes it to be the relation between the effective working time used for making connections to the total working time, regardless whether the operator exercises several functions at the same time, consequently uses up more energy per time unit, or not. He argues correctly that systems of about the same capacity and working with the same load require about the same amount of energy on the part of the operator so that the effective working time is about proportional to the total working time in all systems that work with similar apparatus.

This *alpha* cannot be used, however, for comparing systems that vary so widely as the manual and semi-automatic systems do, for the amount of energy exerted by the operator depends here on the different functions needed to make connections, and since these functions in the different systems vary in mental and physical exertion. In one system we have the necessity of operators reaching over a large switchboard to make connections, and in the other the field to be covered is limited to a very small area. The quantity of energy needed for each connection is not decreased by combining unlike functions, i. e., functions controlled by varying volitional acts, but it is decreased by functions of a like character that have been combined in a mechanical equipment.

The simultaneous execution of several functions is dependent on the frequency of their occurrence during a time limit. We are dependent therefore on the number of connections and the manner in which they are made. It seems better, in comparing the capacity of different systems, to compare the efficiency and capacity of the operators, basing the results on the energy expended in making connections.

In considering the manual service, we find that at the A-operator's position we can combine only the functions used in disconnecting to form series of movements of a similar kind. These movements are simple, are at no great distance from the operator's seat, and must be handled in most cases with care and in single cords in order to prevent the disconnection of wrong subscribers' cords in a busy switchboard panel. When using the connecting jacks in the multiple field the repeated wide reaching is avoided only when several jacks are to be removed at the same time. But since the time allowed for severing connections is only 0.8 seconds, it is clear that there can be obtained no great saving of time by combining several movements that are used for this end, even if this were possible. In distributing systems this time will probably not exceed 0.2 seconds. In unlike functions of operation the matters lie somewhat different and here considerable time can be saved, but no amount of energy.

We will now go further into the measurements of the *alpha* in practical manual and semi-automatic operation. Johannsen in his tests determined the capacity of work that can be placed on any one operator as being $r=1$, in that he used operators for a greater length of

time and for a larger number of cases, so that they worked with great accuracy and speed without pauses and practiced like or unlike movements. He states that aside from the waiting pauses of subscribers one-half of the number of connections made per hour (x=0.5) is to be considered as a normal average day's work for an operator, which she can perform without fear of exhaustion. In reality x will be larger than 0.5 as the decrease in load during certain periods of the day will not permit the work to be combined into series of like movements. It is also clear that x^1 is larger than x, for the experiments of Johannsen on the maximum limit of work past the safety stage from the health standpoint of the operators is to be considered as standard.

Johannsen found that for a complete connection with the two-cord system a time unit t=6 seconds is about right. The author, basing his tests on those of Johannsen, made similar experiments and found this time to be a little higher, being equal to t=7.7 seconds divided as follows:

Answering call of subscriber=1.3
receiving and repeating number=3
testing line, plugging, calling=2.1
disconnecting at end of call=1.3

7.7 seconds

The variable quantity in the above experiments is the time for answering call and obtaining number. The greatest speed of the operator and desire to do the maximum labor in minimum time cannot make the subscriber answer quicker or speak more distinctly. While we can obtain an ideal state of working from the operator, we cannot expect this from the subscriber. Consequently it means either more or less work and more or less time for the operator, depending on whether the subscriber speaks quick and clear or whether he is slow and mumbles his number. Here then the education, national characteristic, dialect and other features of the subscriber come in play. Even with the best trained telephone user, we will find that the American will act different on the telephone from the polite Italian or Frenchman, and the average time taken for this part of the service is therefore better taken at 3 seconds and not less, as some would have it.

For the work of a distributing operator, Johannsen thinks 3 seconds too little, and places the time at 4 seconds. We have then

distributing operator's work= 4
A-operator's work = 6.7

=10.7

For operation with trunk lines between exchanges, the time would increase to 18.7—

Distributing operator =4
usual work of A-operator=6.7
capacity of trunk lines =3.5
work of B-operator =4.5

18.7 seconds

The increased capacity of the A-operator in seconds, counting on 100 per cent calls being sent onto the trunk lines (trunking), as against the simple common battery system, is obtained from the relation between the connections in the heaviest traffic period and is

$$\frac{244}{170} = 11.11 \text{ seconds.}$$

Johannsen demands that in all manual systems the average limit of capacity for an operator be laid at 0.5, allowing an increased load on the operators during rush hours, but adding the supervision work, the increased attention needed for watching two types of signals for calling and disconnecting into the periods of rest. To this x, the x^1 of $\frac{0.5 \times 7.7}{6.0}$ =0.64 or 0.65 would correspond, where the decrease in the rest periods is not considered. This determination of 0.5 for the maximum capacity to be expected of operators without injuring their health will bar the attempts to judge operators' capacity at higher limits. Of course this 0.5 is bound to change, since we must take consideration of time of service of the individual operators, of the average age, racial characteristics, climate, working conditions, etc. The x which may be expected from the operator is also dependent on the complexity of the system used, when we consider every function of the operator to be executed in the consecutive order from the beginning to the end of a call.

We have a different point of view when we consider semi-automatic service. The service required of the operators is very simple, consisting mainly of inquiring the number and choosing the right number on the dials, whereby the repetition of the number simultaneously with pressing the keys is almost an involuntary action. There is no change between two groups of manipulations, no supervision of calls, and during rest periods the operator has absolute rest. The time for making connections can be reduced to 3.5 seconds. Here then we have the question how far we can utilize the energy of the operator above the 0.65 limit, taking account of the simplification in operations. So far there have not been numerous experiments, and so a guess will have to do for the present, which would increase the x^1 to 0.75 as permissible maximum. The following table shows the comparison of the different systems, and is based on actual tests:

Time for obtaining number.	3 Sec. Calls.	4 Sec. Calls.	(Campbell) Western. Calls.	Johannsen. Calls.
Ordinary two cord system	269	236	244	265
Distributing system	219	200	...	230
Distributing system w. 100% calls per trunk line	125	119	...	152
Semi-automatic system, $x^1 = 0.65$	670	520	...	...
Semi-automatic system, $x^1 = 0.75$	770	600	...	...

(The above numbers represent all calls answered per unit of time per operator.)

Observations in actual operation in semi-automatic systems showed that repeating the numbers went on simultaneously with the pressing of the keys and that in most cases the last key was pressed down a fraction of a second after the number had been repeated. Since in this system we always have the same conditions for the key pressure, it is possible to get a maximum capacity for all necessary operations. Thus it was found that the pressure of the buttons was made.

in 730% of connections within 1 second
in 950% of connections within 2 seconds
in 993% of connections within 5 seconds

after repeating of the number. The operator finished:

250% of connections within 3 seconds
750% of connections within 4 seconds
950% of connections within 6 seconds

It seems then that in the semi-automatic the value x=1 could be obtained without injuring the health of the operators. A control of the time elapsing between receiving a call and answering it by the operators

showed that: 50 per cent of all calls were answered within 3 seconds; 70 per cent within 4 seconds and 97 per cent within 10 seconds. If higher results were obtained at any time it was done at the cost of the rest periods of the operator and should be avoided. In addition we must remember that a small number of subscribers for a small exchange, which was used for the tests, can be educated to give their numbers quickly, especially if these numbers remain within three figures. Longer numbers will always take more time to give, more time to be repeated and will give smaller operating results. The above results are not to be taken as a eulogy for the semi-automatic system, however, not as a slur on the manual system, but merely as an indication of actual tests and as a standard for the capacity which we can expect from operators without injuring their health.

USE OF AIR RESONATORS FOR TELEPHONE SOUNDS.

If a telephone is used to indicate alternating currents, it is desirable to obtain a certain frequency. We obtain this by using the electric resonance effect, or else by making the telephone sensitive to certain frequencies by the use of several plates, as is done in the optical telephone. We can reach the same end by placing a Helmholts resonator between the telephone diaphragm and the ear. From the resonator a tube leads to the ear of the observer. In 0-methods where it is a matter of very weak tones, the strengthening of other sounds found in the resonator gives rise to trouble. The author used closed ball resonators which possess a large number of very high sharply distinguished natural tones, which appear in different ways, accordingly as we pass the sound to be investigated to the center of the resonator through the tube, or else pass the sound to the resonator, keeping the latter close to the inner wall. The sound of a telephone operated by an a. c. takes on a loud piercing pitch when the resonator is used. The accurate calibrating of the resonator is accomplished by screwing the two hemispheres together. This method can be used as a substitute for the optical telephone and the vibration galvanometer, since both these elements are too delicate when high frequency currents are tested. When using an arrangement with the Wheatstone bridge, the difficulty of keeping the frequency constant can be avoided by using dampened condenser discharges which are produced in a circuit that has been reduced to the right frequency of tones. This circuit is inductively coupled to the bridge. With this arrangement it is possible to measure frequencies from 500 to 10,000. A further use might be found in wireless telegraphy in the system of the sounding spark, in that the acoustic effect is obtained in addition to the electric selection. But as the tone needs time due to the accentuated resonance, this arrangement could only be used at the expense of speed in telegraphing.—*Verhandl. der Deutsch. Physikal. Gesell.*

TELEPHONE CABLE, WIEN TO DALMATIEN.

This year the Austrian government completed the telephone connection between Vienna and Zara in Dalmatien, a distance of 815 km. (500 miles), of which 59 km. (36 miles) are submarine cable connections. The wires used for the overhead lines are 5 mm. bronze wire. The most important question was the use of a right cable for the submarine distance. Gutta-percha cables of normal construction do not give good enough results for telephone work, and it was therefore a question between the Pupin and the Krarup cable. i. e., either cables with self inductive loads distributed at certain concentrated intervals, or cables in which the self inductive load was evenly distributed. The Krarup system was finally adopted, mainly because the frequent change from submarine to aerial work gave better results than with the Pupin cables. Following are a few details about the cable: These cables are four strand, constructed as follows: The conductor is formed by a round copper wire surrounded by three flat copper wires with a total cross section of 5.5 sq. mm. This copper conductor is enveloped by three layers of soft iron wire of 0.2 mm. diameter, and then covered with a double layer of gutta-percha. Each two strands are twisted together, and then the two sets are twisted. To protect the cable against the attacks by marine life, a covering of brass is next wound around the conductors. The submarine cables for deep sea use are armored with 24 galvanized iron wires of each 5.7 mm. diameter, and the cables near the coast have 20 wires of each 7.1 mm. diameter. The cables were laid last November by a freighter equipped as a cable ship. After the completion of the line, tests were made and gave a clear sound in spite of the losses found to occur on several of the islands over which the overhead lines passed, where the wires and insulators were found to be covered by layers of salt at times of the thickness of a finger. Since then the line has been extended to cover a distance of 1,400 km. (840 miles), using only 3 and 4 mm. wire for the greater part of the distance. Before laying the submarine cable tests were made to see what quality of sound and tone would be obtained when placing the two pairs of conductors in series. The results were such that the attempt was made, and as a result we have a cable of 120 km. length, which could be connected to the 630 km. overhead line and gave good results for communication.—*Elek. Zeit.*

TESTING TELEPHONE AND TELEGRAPH LINES.

The usefulness of a telephone line for interurban traffic depends on three factors: 1. The dampening effect suffered in the line when passing from one end of the line to the other end. 2. The external noises caused by neighboring telegraph and high tension lines and atmospheric influences. 3. The strength of other messages overhead from other telephone wires. To measure the damping effect of long telephone lines tests should be made with the testing apparatus designed by Breisig. The connections used in the testing instrument represent lines having different damping coefficients. In these test lines speech is transmitted with the same clearness and the same quality of sound as in the real lines. To make the tests two telephone wires which start at the testing place (the exchange) and running in the same direction are connected at the other end. At the testing exchange two telephone instruments are connected with the test line and the test instrument in such a manner that either the testing telephone line or an artificial test line in the instrument can be connected to the telephones. A certain damping effect is registered in the test instrument, and while the men testing count without interruption tests are made whether speech is clearer when coming over the real or over the artificial line. This testing is carried on until both arrangements show the same strength in speech.

Where double telephone lines are used, the inter-

ference of atmospheric disturbances, and through neighboring wires is of much greater importance than the damping effect, and here it is essential to obtain the strength of the disturbing factors. The Hamburg exchange used a certain wiring arrangement that has given excellent results and is shown in the figure.

I, II, III and IV are the branches of the four-wire telephone line that are to be tested. In place of the telephone instruments in the transmitting exchange an alternating current source is placed between the coils of the branch lines. At the receiving station, the coils are either connected with each other directly or else over an ordinary telephone receiver. A variable resistance is connected to this a.c. course to which a telephone receiver is connected in parallel. To make reliable cur-

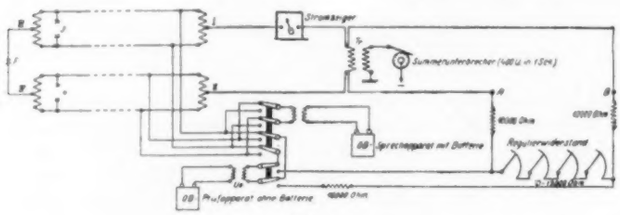


Fig. 1.

rent measurements, the variable resistance must be free of induction effects. This same arrangement can be used to test the sensitiveness of a telephone line to disturbances from other neighboring lines. Such disturbances can be reduced to two causes, either the electrical properties of the two branches of the telephone circuit are unequal, or else their symmetry in relation to the induced current is disturbed. Causes for lack of symmetry in the first case are often to be found in interior exchange equipment. The requirement for this inner symmetry must be observed in all lines, that of symmetry with the induced current can only be expected where strongly inductive lines are in the neighborhood of a telephone line. Telegraph lines are often causes for disturbing influences.—*Elek. u. Masch.*

ACCIDENTS WITH TELEPHONES AND THEIR PREVENTION.

The use of the telephone receiver is sometimes accompanied by disagreeable features, that may be followed by disturbances to the health of the person using it. Dr. Förster, in the *Berlin. Klin. Wochenschrift,* gives an interesting account of studies he made on telephone operators and the relation telephone service has to their general health. In past days it was thought that the passing of an electric current from the line into the body of the operator was the only danger to be considered. Meanwhile technical skill has insulated lines so completely than danger from this source is negligible. Investigations in instruments that figured in accidents showed that the current did not pass through the telephone instruments. One cause of danger to health may be very loud noise, due to quick turning of the crank, and this danger may be increased by the sudden shock which an unexpected noise very close to a person always calls forth. With sensitive persons the results are temporary deafness and earaches. This may lead to deafness to certain sounds, dizziness, fainting spells, and cramps or hysteria. After the accident there occurs an aversion against all telephones, even those used for private service. Causes for many disturbances are the clicking noises heard in the receiver. From the physical standpoint, the fear of electricity plays a role in the health of operators. Likewise suggestion is of great importance, especially if it should happen that a considerable number of operators in the same exchange have met with some physical difficulties during service.

Tests by Herr Baehr showed that the clicking noise is much weaker if instead of the 6 cm. diameter iron membranes a mica diaphragm is used, which has a circular hole in the center about 2 cm. in diameter. This hole is covered by a thin iron membrane which is slightly larger than the 2 cm. hole. Dr. Förster tested out both receivers by using them for several weeks. To one ear he held the ordinary receiver, to the other the Baehr improved receiver. In addition he had currents of high tension work upon his two receivers, since these types of current give the most disagreeable noises. The clicking in the new receiver was found to be much softer than that in the old. Accidents to operators doubtless can be eliminated by using this new type of receiver or others built on a similar plan. Besides taking away the fear of the clicking sound from the operator's mind, it also tends to preserve hearing. Prof. Bernhardt found upon investigation that aside from such rare cases as effect of lightning on a telephone line or else contact with a high tension line, the effect of an induction current on an operator is very slight, and resulting sickness is due more to the suddenness of the shock and the peculiarity of the sound on the ear than the current strength itself. Thus tests made on a large number of people, among them weak women, showed that condenser discharges up to even 700 volts never had an influence on the health of the persons.

Blegard in Copenhagen examined 540 telephone operators and came to these conclusions: No influence on the organs or on the faculty of hearing is to be noticed from professional telephone service, provided the organs of hearing were in good condition in the start. On the other hand there is no sharpening of hearing, as telephone operators often claim. The sudden clicking of receiver membranes or other sudden unexpected noises may lead to ear troubles, both in those who are in good healthy condition and in those whose ears are weak or already slightly affected. Dr. Schochner observed a 49-year-old railway operator who was telephoning during a thunderstorm and received a shock, which resulted in deafness, dizziness and a heavy headache. It was not known whether the man's ears had been affected before the accident. Dr. Beyer reported 36 cases of accidents in telephone service and stated that in none of them the results led to permanent injury to the ears or to hearing. Even if a telephone operator may become useless for further telephone service, nevertheless she does not become an invalid and incapacitated for other work.

At the medical convention in Frankfurt a. M. one case was reported in which a subscriber rang his telephone bell so violently that the ear drum of the operator was injured. The drum healed, forcing the operator, nevertheless, to seek other employment. The subscriber in question was forced to pay the hospital bill and damages. Even though high tension currents of the ordinary weak current may reach the instruments, it is not the electric current which is directly responsible for accidents, but rather the violent vibrations of the diaphragm in the receiver, leading to sudden high air pressure and loud noises. The nervous disorders of telephone operators after recovery from accidents show no new symptoms and range from slight nervous disorders to the

worst cases of hysteria and cramps. Inconsiderate treatment by supervisors has often been found to be a contributory cause to injuries, especially of a nervous kind. Another helping cause is suggestion. Sometimes the operators are influenced by the suggestion of rest cures in sanatoriums and in rest colonies, the hope for sick benefits and pensions, and imagine they are sick, while at first there may be nothing wrong with them. Unless such cases are attended to soon, and the operator brought into a normal state of thinking, it may happen that the disorder becomes almost a hallucination and fixed and may lead to real sickness, especially in nervous people. Dr. Beyer studied a large number of cases of operators after accidents and found that no matter whether they were willing or unwilling to return to active telephone service, in the majority of cases service was found to be impossible. Permanent injury to the nervous system may also accompany accidents, if at the time of the same the operator was tired or exhausted. The German postal authorities controlling telephone service have come to the conclusion not to reinstate telephone operators, who have met a professional accident, in active telephone service, but to use them for general office work.—*Zeit. f. Schwachstrom.*

The Lay of a Layman

By the T. E. Dopester

FROM information received at this office, state commissioners are meeting with much difficulty in their efforts to secure reports from the small telephone companies. The threat of enforcing a penalty is without effect. Reports coming from the operators whose systems are inconsequential, taken as a unit, but whose aggregate amounts to much, are usually slip-shod and unintelligible. The commissioners realize that the one-man plant is apt to develop such fault, but it regrets so much of it exists. The commissions cannot compel systematic and comprehensible accounting methods when there is no disposition shown among the little fellows to co-operate. Many of the concerns of this nature which do report, show practically no earnings, but the commissioners believe this is entirely due to improper accounting. This conclusion is based upon analysis of the companies that do report, the findings invariably showing larger gross business for 1912 over 1911.

* * *

But the problem to get information from the small operator is still with us. For twelve years we have been trying one scheme after the other to gather statistical data from independent telephone operators. It has never resulted satisfactorily. Some of these smaller operators will subscribe for their technical journals, but they are few and far between. Not infrequently John Doe, purporting to be the manager of the Weeping Hollow Telephone Company, will inform us to drop the name of Henry Johnson from the list, saying that "Henry died last month—he read too much."

* * *

It is for this and other reasons that our work is made more interesting when we turn to the Bell's astonishing statement that the first quarter of 1913 points to further record smashing in the telephone business. We are not hero-worshippers in this hurdy-gurdy day. Mr. Morgan died last month, and while I recall that I was in New York the day of his funeral, I had to read about it the following morning. In other words, Mr. Morgan's death didn't stop the business world. Mr. Theodore N. Vail assumed the presidency of the American Telephone and Telegraph Company a comparatively short time ago, but we are not stunned when we reflect that that concern has enjoyed an extension of $100,000,000 under his administration. We are not hero-worshippers. Mr. Vail would score high if we were. The first quarter of A. T. & T. Co. shows an increase over the same period of a year ago, amounting to more than eleven per cent, or at the rate of nearly $22,000,000 a year. Let us hope that the full penalty be imposed upon the small operator by the state commissioners. We should know what independents are doing.

* * *

The Eastern Pennsylvania Independent Telephone Association has been formally launched by twenty-one of the unadulterated operating companies which lie east of a line drawn through Altoona in the Keystone state. The aim and purpose of the new holier-than-thou members "is to cement together in a firmer union all independent telephone interests" in that territory. "No company, firm, corporation or individual engaged in the telephone business in opposition to any member . . . . shall be eligible to membership . . . . without the written consent of the member in whose territory said company is operating." To interconnect with competing interests is tabooed under the penalty of expulsion. Such old war-horses as J. Walter Barnes and Bert G. Hubbell were present to offer counsel and advice. Whatever the need for this new association is hard to conjecture.

* * *

Last fall the Bell Telephone Company of Pennsylvania negotiated for the purchase of three independent systems in *western* Pennsylvania. They were the Broken Straw & Stillwater Telephone & Telegraph Co., operating in the vicinity of Youngsville; the Sheffield Telephone Co., Sheffield and vicinity, and the Northeast Independent Telephone Co., at Northeast. I never learned whether the purchase was consummated, but when the matter got into print it was alleged to have been of long standing. Standardization of system in eastern Pensylvania may make it easier going for the new association's membership should a bidder come along for their property.

* * *

It will be remembered that the Federal Telephone & Telegraph Company is the holding concern for the Inter-Ocean Telephone & Telegraph Co. The Inter-Ocean is the independent long-distance operator through that part of the country—from Buffalo toward the east. This is the concern that was to afford the connecting link from the west to that haven of dreams—Greater New York. With these you may easily connect the Frontier Telephone Company of Buffalo; the Century Telephone Construction Com-

pany, of the same place, and B. G. Hubbell, who still gets his mail at the eastern extremity of Lake Erie. The activities of the new Independent Telephone Association smack of politics. Let us hope that there is a group of independents left who will actually man the guns and hold the fortification. If we must sell, let us get what is coming to us.

* * *

And right on the heels of what has gone before comes the statement of H. Lee Sellers that he can use the name of the Metropolitan Telephone & Telegraph Company till he is black in the face—the court having granted him that privilege only recently. The Bell has been holding the injunction.

* * *

Now, when are we going to build New York, as Independents? Why haven't we had a letter from Pop Reynolds? Fellows, I'm thinking this is going to be a regular humdinger of a year.

* * *

Very few groups of dependable figures have been handed down by independent telephone operators. Ten years or more ago, it wasn't unusual to find a little circular that pointed to the benefits of telephone competition and as part of the offering the rates before and after taking were lovingly referred to. For example, take Kansas City in 1900. The comparison was something like this: Bell rate, unlimited, $96.00—Bell telephones, 9,800. Bell rate under competition, $48.00, limited to 960 calls. Independent rate, unlimited, $54.00—Independent telephones, 36,500. Cost of service, both systems, $102.00, or only $8.00 a year for nearly 40,000 more stations. I wonder what has become of that old line of argument? Statistics that formerly told the tale wouldn't answer nowadays, but there will always be competition in some parts of the country. Popular demand is easily swayed. After the state commissions, then what? Don't forget that the business of replacement will always obtain. Telephones have been made to last, but they eventually pass on. In the meantime, what is a good argument for an amateur promoter? I have an inquiry and I'm up a tree.

* * *

Last month I pointed out how the Bell Telephone Company capitalizes the rural inter-connections. I have had my attention called to the way Western Union Telegraph Company throws its friendly arms about the neck of that same rural subscriber. Of course, Mr. Vail is author of all the literature intended for his stockholders, and his stockholders happen to own Western Union as well as A. T. & T. See, then, how the farmer-lines work into the Western Union scheme of things:

The Western Union has some 25,000 offices, of these the gross revenue of over 20,000 is not sufficient to pay the expenses of the office.

Eighty-five per cent of the gross telegraph business of the country is between less than 5,000 towns and cities, that is, four-fifths of the offices of the Western Union and fully one-half of its wire mileage is maintained at a loss in an effort to give that general and comprehensive telegraph service which the business and social interests of the country require.

There are estimated to be less than about 5,750,000 rural habitations in this country.

The Bell system has over 3,200,000 rural telephone stations; that is, more than half the rural habitations are connected by exchange wires with central offices of rural centers and these central offices, by means of branch telephone lines, with and form a part of the Bell Telephone system.

These branch lines extend to substantially every rural center. They are not used to nearly their capacity. The lines and the operating staff have to be maintained for one purpose.

Under a joint working between the telegraph and telephone, these facilities, both plant and operating, could be utilized without appreciable extra cost, for telephoning the occasional telegraph message.

The italics are mine. Mr. Vail understands the whole value of the "local, co-operative and rural independent companies or associations having sub-licensee or connection contracts." I am only hoping, however, that the accounting departments of his intelligence transmitting concerns will render both bills on a single statement. And if he can wipe out 20,000 non-revenue producing telegraph offices, maybe I can telegraph a ten-word day message to New York for less than fifty cents.

* * *

This matter of telephone accounting is having the serious attention of the Telephone Service Association, which is under the direct supervision and management of Frank L. Eldridge. He has established his headquarters "next door" to the National Independent Telephone Association. This will, in all probability, give him access to the meagre statistical data now available. If it is to be had anywhere, the National Association has it. Mr. Eldridge realizes that a systematic method of operating and accounting is necessary for the small exchange. The rural telephone system will never prosper so long as it confines its bookkeeping to a list of subscribers' names. Not infrequently there is no contract; the rate is always inadequate; the privilege of the subscriber, while circumscribed, is too liberal; the service itself is in too many instances an abomination and the ability of one man to attend to the details is beyond hope. Collections are permitted to lag, because the farmer is traditionally slow pay. Merely because he is good for it, doesn't entitle him to a year or more. There are exceptions, of course, but they are few and far between. I have been very closely affiliated with the telephone business for twelve years. I know that the record shows something like twenty thousand independent telephone companies. Seventy-five per cent of this number never subscribed for a technical telephone journal and I dare say that the libraries of this same seventy-five per cent begin and end with the literature that the manufacturer has supplied without cost. If I had all the money that I have spent in soliciting subscriptions and furnishing free copies of my magazines, I would be found with a better rating in B. & D. My prayer goes out to Frank Eldridge in his work of educating the small operator. He represents a good cause to tie to. As a concession to his members, I'll throw off two bits on every subscription that comes to me with the sign that he belongs to the T. S. A.

* * *

I hark back to the beginning when Dad Hinds invented his "Telephone Lease Record." Dad has been rooting around among the farmer exchanges for so long he is venerable. Well, he discovered, years and years ago, that a book of some kind was essential to the welfare of the country system. He brought out his book and is probably still selling them, because, so far as I know, it was the first and last that ever had an inning. Besides, Dad was right there to show it and back it up with his personal appeal. The trade press tried to sell it, but the thing didn't go for the

very good reason that the same trade press never reached that far into the woods. With the thousands and thousands engaged in the telephone business one would expect the circulation of the trade press to be something marvelous. It is. No publication devoted to telephony has ever attained a paid circulation of ten thousand bona-fide subscribers. The Bell companies employ two hundred thousand people. To hang prophecy on this figure there are probably a million people finding employment in the telephone world's work. Dad Hinds must sell his book as he goes along and his territory is only a part of Iowa.

* * *

My old friend Rufe Holbrook, erstwhile of the contemporary downstairs, has also buckled on the armor in the interests of the little fellow. Here's luck. When we get independent telephone organization we will have a better opportunity to talk turkey to the turkeys.

New York Commission News

A reduction in telephone rates from subscribers' stations within the so-called exchange area of Forest Hills, in the Borough of Queens to principal points in the Borough of Manhattan from 10 cents to 5 cents, has been ordered by the New York Public Service Commission, second district. The new rate must be put into effect on or before June 1, 1913. The order was made following the complaint of Forest Hills Taxpayers' Association of Elmhurst.

The commission has received notice from the Olean Inter-State Telephone Company, one of the Bell system companies, to the effect that it has acquired the ownership of physical property of the Hinsdale Mutual Telephone Company of Hinsdale, N. Y., the George U. Saxton Telephone Company of Delavan, N. Y., and the Machias Telephone & Electric Company of Machias, N. Y. The Hinsdale Company was purchased for the sum of $2,350, the Saxton Telephone Company for $1,000 and the Machias Company for the sum of $12,000.

Between climbing poles and making reports to state officers, the lot of public service corporation officers is not a happy one. A secretary of a telephone corporation wrote to the Public Service Commission advising that "he would attend to report business as soon as he can get over the effects of a fall from a pole which has temporarily put him on the 'hog.'"

The commission has ordered the Granville Telephone Company to restore on or before May 15, 1913, the limits of the exchange area including Shushan to the status existing prior to October 1, 1912, and to cease and desist from making any toll charge for messages between its subscribers located in Salem, N. Y., and other points in the former exchange area in the State of New York. On October 1, 1912, the company established a new schedule of rates whereby the subscribers of its Salem exchange are required to pay certain increases in rentals for local service, and at the same time the company changed the Salem exchange area by excluding the Shushan, N. Y., and Rupert, Vt., exchanges and introduced a toll charge of five cents per message between its subscribers located in Shushan, N. Y., and Rupert, Vt.

The Fitzgerald bill transferring the jurisdiction over telephone and telegraph companies from the Public Service Commission of the second district to the Commission of the first district, New York, was defeated in the Senate on April 15.

The commission has received notice from the New York Telephone Company that it has acquired the physical property and business of the Commercial Union Telephone Company at Saratoga Springs and Mechanicville.

The commission has authorized the Fleischmann Telephone Company to issue its common capital stock to the par value of $19,000, to be sold at not less than par and the proceeds used to acquire all of the property of A. H. Todd, located at Margaretville, Fleischmann, Arkville, Kelly Corners and Halcottville, New York. The Fleischmann Company is also authorized to issue $9,000 of common capital stock for new construction at Fleischmann, Margaretville, Arkville, Kelly Corners and Halcottville, Delaware county.

The commission has received notice from the New York Telephone Company that it has purchased and acquired the physical property and business of the Auburn Telephone Company operating at the City of Auburn, N. Y., for the sum of $306,000.

The commission has ordered the New York Telephone Company to make an addition to its line extending along or near the Buffalo-Batavia state road from the end of its present line to connect with the eight subscribers located on or near this road, providing one or more of the subscribers give a bond covering the taking by the eight subscribers of multi-party line service connected with the company's Williamsville exchange for a period of three years at a rate not less than $18 per annum as a base rate plus $2 per quarter mile as line mileage. The order is made following the complaint made by Patrick O'Day, whose residence is within two miles of where the company's line is now constructed and four miles east of Williamsville on the Buffalo-Batavia state road. The Pioneer Telephone Company's line now ends about one and a half miles to the east of complainant's residence. The company refused to make the connection, except upon the building of two miles of line at a cost of $670 and an annual rental of $66. The commission is of the opinion that the company should make the extension upon the filing of a bond which was offered by complainant, and the New York Telephone Company may, if it wishes, work out an arrangement, for the extension of the line can be made by the Pioneer Telephone Company which operates in the locality in question.

Ohio Commission News

The Cincinnati and Suburban Bell Telephone Company was supported by the Ohio Public Service Commission for removing telephones alleged to be used by violators of laws. In effect, the decision of the commission establishes a precedent for the telephone companies. The case was that of Harry Aiken and Thomas Flannery against the Cincinnati and Suburban Bell Telephone Company. The commission was asked to compel the company to install telephones in their places of business. The telephones of both these subscribers were removed when the Cincinnati police department informed the company that the subscribers were selling pools on horse races. Much of the business, it was said, was transacted over the telephones. After the company had removed them, a formal demand was made for their reinstallation, which was refused unless the subscribers signed an agreement that they would discon-

tinue any illegal business. The subscribers refused to make such an agreement and the company would not restore the telephones. In its findings, the service commission says that the company has the right to remove its property at any time when satisfied that a subscriber is using the property to further his or her interests in some illegal scheme.

Asks More Power for New York Commission

Pledges made in the state platform of the Progressive party to give additional powers to the public service commission were embodied in three bills which were introduced at Albany, N. Y., recently. The power thus given the commissioners is similar to that exercised by the Interstate Commerce Commission over rate questions. The measures provide that in any hearing by the commissions as to change in rates or service the burden of proof to justify the change shall be upon the company; that in any proceeding as to the reasonableness of any rate or the adequacy of any service the burden of full disclosure of all the facts as to such rate and service shall be upon the company, and when a schedule is filed changing a rate or a service afforded by a public utility corporation the commission may suspend the taking effect of such a schedule pending an investigation of the reasonableness and propriety of such change.

Another bill aims to limit the power of the courts in the review of orders of the commissions to questions of law alone; also it abolishes the dilatory writ of certiorari as a means of reviewing orders of the commission; provides that no injunction may be valid against an order of the commission, unless the latter is duly notified and rules that the person asserting the invalidity of the order of the commission shall bring proof of the invalidity.

Rate Report of Pennsylvania Commission

The Pennsylvania Railroad Commission has for a long time been investigating the conditions of the telephone business throughout that state—the basis of prices heretofore existing, the operations of this schedule of rates, and the inequalities that have arisen from time to time.

The commission, it is said, has been at work on this subject for virtually four years; but the special investigation which resulted in the report made just recently began about a year ago. The new schedule embraces all classes of telephones in common use. It offers two scales of prices: one for the measured or limited service, the other for unlimited service; and it considers the difference in value in each case whether rendered by a direct or a party line.

For the measured service the minimum is 600 calls per year, less than two calls a day, for which the charge is to be $30 per year, or five cents a call. Additional messages will be five cents each.

For 800 calls $36 is charged. When 1,500 calls are reached the charge is to be $57, or four cents thereafter. Then, as the calls increase, the rate declines to three cents and two cents.

In this measured service an auxiliary line and station is to be supplied for $24 per year, and the extension telephone is charged for accordingly.

When an office is located in a residence, full business rates shall be charged.

Eight districts are established by the rate, the first district with a million or more inhabitants and the eighth with less than 5,000 inhabitants.

This scale makes $54 the price for a residence telephone in Philadelphia, with $78 as the rental for a business telephone and $36 for residence telephone in a zone, these rates applying to direct lines.

In cities of 25,000 to 50,000 population a business telephone will cost $33, a residence telephone $27 for a direct line, $27 and $22 for two-party, $25 and $19 for four-party or for multi-party.

When an extension station with bell is to be supplied, annual contracts are for $6; without the bell, for $3.

When an office is located in a residence, as in the case of doctors, full business rate is to be charged.

The commission in its report says that the investigation shows that the Bell system provides for thirteen different schedules for exchange service in the central and eastern part of the state independent of Philadelphia, and twenty-eight in the western part, excluding Pittsburgh. It adds that there appears to be no satisfactory explanation of the existence of so large a number of varying schedules.

Oregon Commission News

Alleging that the Pacific Telephone & Telegraph Company has been in the habit of making charges for service after telephones have been removed, Fred W. Graves, of the Graves Music Company, of Portland, filed complaint with the commission that he had been charged for service including some long-distance calls two months after his telephone had been removed. He declares this happened to him once before.

On behalf of Oregon City, William Beard, retired farmer; F. J. Tooze, educator, and W. A. Long, machinist, are the plaintiffs in a complaint filed with the commission against the Pacific Telephone & Telegraph Company. The complaint was filed by City Attorney Stone.

The complaint alleges that prior to January 1, 1911, the company charged $1.25 a month for a telephone on a four-party line, and that since then it has raised its rates to $1.50, but that many subscribers are still getting their telephone service at the old rate.

This is similar to complaints that have come from many parts of the state and the entire matter will be gone into by the commission when it holds its hearing to determine what rates the company should be entitled to charge as based on the physical valuation of the company's property.

Long Distance Toasts Feature of Banquet

At the annual banquet of the Telephone Society of Baltimore, held recently in the Monumental City, the response by long-distance to four toasts made the occasion a memorable one. Governor Mann, from the official desk at Richmond, Va., was the first of the evening's special speakers to address the three hundred and fifty men, all of whom clearly heard his long-distance message, including the introductory joke. The governors of West Virginia and Maryland, also A. Graham Bell, of Washington, were others on the program who contributed via Mr. Bell's long-distance invention.

The Chesapeake and Potomac Telephone Company operates in the three states whose governors had been invited to address the gathering.

Amicable End to Boston Operators' Strike

Through the efforts of the Boston Chamber of Commerce committee which took part in the telephone conference, the New England Telephone & Telegraph Company has reconsidered its wage schedule and granted an increase to its operators. The company took as a basis for this increase the anniversary payment system, which the girls rejected, and will pay practically the same amount in the form of weekly wages. It also grants increased pay to the younger operators. At the outset this increase is granted only to the employees of the metropolitan district, but as soon as the wage scales in the other large cities can be considered they will be readjusted. The new arrangement is by no means the original demands of the girls, but is a compromise.

The new scale for the metropolitan district, to go into effect June 1, is as follows:

1—OPERATORS.

Operators will be paid weekly wages as follows:

During the training period	$5.00
On assignment as operator	6.00
At end of three months from date of entering school	6.50
At end of six months	7.00
At end of nine months	7.50
At end of one year	8.00
At end of one and one-half years	9.00
At end of two and one-half years	10.00
At end of four years	11.00
At end of six years	12.00

These rates of pay only apply to operators on day positions.

Operators on afternoon-evening work and on "divided hour" work will work one hour per day less and receive $1 per week more than day operators of corresponding rank.

Operators on night work will receive $2 per week more than day operators of corresponding rank.

2—SENIOR OPERATORS AND SUPERVISORS.

Senior operators	$10.00 to $13.00
Supervisors	12.00 to 15.00

Senior operators and supervisors on afternoon-evening work and "divided hour" work will work one hour less and receive $1 more per week than day senior operators and supervisors of corresponding rank.

3—ASSISTANT CHIEF OPERATORS AND CHIEF OPERATORS.

Assistant chief operators	$13.00 to $18.00
Chief operators	15 to 25.00

For these employees the wage in each case will be dependent upon the responsibilities of the position.

4—TIME OFF.

So far as consistent with the requirements of the service, work will be so arranged as to give the maximum number of Sundays, holidays and Saturday afternoons to each operator.

5—ADJUSTMENT COMMITTEE.

An adjustment committee shall be created, to consist of three members, to be chosen by the operating force from among its members, and three to be appointed by the general manager or president of the company, to consider and make a finding in reference to any grievance presented to it by any aggrieved member of the operating force. There shall be a right of appeal from the finding of this committee by any party affected by it (and in case of a tie vote by three members of the committee) to the general manager, and from the decision of the general manager to the president of the company. When the general manager feels that the interests of the company demand it, he shall have the right to set aside or modify the decision of the committee; but in case of such action the committee may appeal from the general manager to the president. This committee will be created as soon as possible.

A Stockholm report states that the English Marconi Company has just purchased the patent rights in connection with the Betuland automatic telephone, a Swedish invention. The price paid is said to be over $500,000.

Experiences of the Flood

Tiffin, Ohio., was one of the cities that suffered most from the flood. Following are clippings from a Tiffin daily paper, describing some of the events of the awful days when people were marooned in high buildings and the rescue squads did an almost impossible work:

Telephone communication was entirely cut off from cities and towns east of here, until Friday noon. This was due to the sleet storm which raged Wednesday night.

Otto Gauthier, the telephone company's wire chief, can justly claim the major portion of the credit for saving the lives of Mrs. Perry Strong, Mrs. Carl Swabley and their children. "Happy Gauthier," as he is known to the Tiffin Consolidated Telephone Company's employes with whom he works, strung wire from the top of the illuminating plant across the houses that stood in from four to ten feet of whirling water to the Standard garage, in the upper flats of which the people referred to lived. Only the roof of the garage was in sight when Happy and Carl Swabley reached the imperiled people and brought them to safety.

About noon on Tuesday spectators were horrified to see a portion of the south wall of the Noble block collapse. Foot by foot the building continued to crumble away and it was seen that if help could not soon be gotten to the occupants, all must be lost. Various plans were considered and finally it was decided that the telephone cable suspended on the top of four poles, one of which was at the Pennsylvania depot and the other adjacent to one of the small buildings at the rear of the Noble building. A cable car on which linemen work suspended to the cable, was sent for to the telephone office up town and a 100 foot rope was hastily procured from the Webster factory. It was then that Lee, Whitley, as he is known to all, arose to the occasion, declaring that he would go across, and furthermore, that he would save those in the building if it held together long enough.

Lee is not a lineman, as was evident from the fact that he at first started his car wrong side foremost. He was told to reverse the frail craft on the wire and then started his perilous journey in a driving rain that chilled one to the very marrow. Slowly he proceeded. Many times he was required to stop for obstacles. But finally he reached the other end. Miss Motry bravely climbed the pole and with the assistance of Lee and the two Motry men she was placed on the car. Willing hands at the other end pulled the car toward safety, while Lee clambered along behind, astride the two cables. It seemed hours before the journey was completed, but finally the last pole was reached and the girl climbed down the pole unassisted. When she stepped into the waiting boat, a mighty cheer went up from the crowd. She was saved at 2:15 o'clock and Lee had been in the air nearly two hours. He was so numbed with the cold that he could not return; but his example had its effect and from an unexpected source.

When it was found that Lee had not the strength to return an unknown man, said to be a hobo, volunteered and evidently being experienced in the work, made the trip in much shorter time and well that he did, for there was now little left of the frail buildings.

Miss Knot was the next to ascend the pole and as she grasped the spike steps the spectators shuddered to see the structure on which she had been standing collapse. The roof turned up in the air, apparently striking her, pinning her to the pole, but fortunately it served to temporarily make her hold more secure. There was now but a precarious ledge running from the pole to the little brick barn, the last of the string of buildings at the rear of the block. Miss Knott refused to come without her mother and so the two were placed on the car. They were brought over safely, and some idea of the difficult task will be gained when it is known that at each pole the women had to dismount and cling to the pole while the car was lifted around the arm holding the cable. They then had to be again placed on the car.

As quickly as possible the men took the car back and the remaining two women, who had by this time been lashed to the pole, were taken on and brought over. The Motry brothers did not wait, but crept across on the cables unassisted. Ten minutes after they had left the place from which it had seemed certain the seven persons would go to their deaths, not a vestage of any of this string of buildings was to be seen, but a single wall and that far from the pole which had been the means of their deliverance.

It was 2:45 o'clock when the building completely collapsed.

New Control Affects Western Union's Income

The expansion in Western Union's gross income under the control of the American Telephone and Telegraph Company is illustrated in the statement for the eight months to March 1. The gross for this period aggregated $30,176,554 and were actually as large as for the full year 1909, when the American Telephone and Telegraph became affiliated with the property. Receipts of $30,176,000 for the eight months mean a gross for the full year of at least $46,000,000, and nearer $47,000,000, if the same ratio of gain, 14.9 per cent, that prevailed for the first two-thirds of the year, holds through the remaining four months.

Despite a $3,913,000 gain in gross in eight months net earnings for interest and dividends were $2,248,000 smaller. Had depreciation, maintenance and taxes remained at the same level as in 1912 the company would have come within $250,000 of earning as much for it as it did in the eight months to March 1, 1912. This increase in maintenance and depreciation is part of the general plan to build up a depreciation reserve adequate for the future. This annual depreciation charge is greater now than it will be five years hence when the reserve for this purpose has reached sizable proportions. Operating expenses this year have increased at the rate of $6,000,000 per annum, or $500,000 more than the prospective gain in gross income. The reason for this is due in large part to increased wages. Operating costs have also been charged with special expenditures for plant rehabilitation.

Consolidation Urged in Ohio

The extent of rebuilding that must be done by the telephone companies as a result of the recent flood has caused widespread advocacy of the consolidation of the two systems in operation in the state of Ohio, according to the Columbus, Ohio, *Journal*. This movement has been particularly active at Dayton where civic and business organizations have organized a systematic campaign with this purpose in view. Letters have been sent to the telephone companies and to the public service commission urging the elimination of the dual system, and the establishment of a single universal service under state regulation to prevent excessive rates. Officials of the two interests here have declined to make any predictions as to the outcome of the campaign but say they are desirous of meeting the demands of the public in any way possible.

This sentiment was expressed by R. R. Stevens, commercial superintendent of the Central Union Telephone Company of Columbus. He said that his company had received a large number of letters urging the consolidation of the two systems at Dayton. While the two companies are, of course, both interested, he said, no definite negotiations have been contemplated. He could not say what course would be taken. Similar statements were made by representatives of the independent company at Dayton, which is under the control of the Morgan interests. Telephone men of both companies, however, declared their willingness to negotiate such a proposition and indorsed it as the most logical and economical way of repairing the flood damage.

Both companies have lost heavily in the recent disaster and sustained crippling of service that will take weeks of reconstruction and thousands of dollars expense. The Bell people have just completed official statistics of their losses, which give a surprising view of the real extent of the floods. The Central Union Telephone Company had 86,091 stations in the flood. This is outside of Cincinnati and Hamilton. The maximum number of telephones put out of service by the high waters was 32,498 and the total number of telephones lost or damaged beyond repair which must be replaced was 7,210. The company lost 51 private branch switchboards. The floods put 7,322 miles of wire in underground conduits out of commission and it will be necessary to replace 747 miles of wire. The overhead or serial wires put out of commission amounted to 16,001 miles and 1,473 have been damaged or lost beyond repair and will have to be replaced.

The extent of the cripling of service and the efforts put forth by the Bell company to get communication established for Governor Cox were demonstrated in the round-about connection worked out. To get communication with Zanesville, the company obtained a line to Washington, C. H., then to Cincinnati, from there to Georgetown, Ky., to Mt. Sterling, Ky., to Huntington, W. Va., Charleston, W. Va., to Parkersburg, W. Va., to Grafton, W. Va., to Pittsburg to Cambridge and then to Zanesville, a distance of 601 miles against the normal telephone distance of 54 miles. To get communication for the Governor to Marietta, the company went to Springfield, to Phoneton, to Lima, to Beaverdam, to Bucyrus, to Wooster, to Pittsburg and in the latter place secured connection with the office of the People's Gas Company and over a private line of this company through Wheeling to Marietta. This was a distance of 506 miles against a normal distance of 121 miles.

Chicago Telephone Rate Change

Two additional sections of the proposed telephone ordinance embodying the recommendations of Professor E. W. Bemis as to rate reductions were tentatively adopted by the council committee on gas, oil and electric light. These sections pertain to measured and flat rate service.

One section fixes the guarantee for a single party residence telephone at $40 a year, which would include 800 outgoing messages. Alderman James B. Bowler desired to amend the section so as to allow 1,000 calls under the guarantee, but no action was taken on his suggestion.

The other section leaves the present flat rates for residence and business telephones unchanged, except that it stipulates that no new service of this type shall be installed in the case of single party business telephones.

Considerable objection was raised to this feature, as it means the virtual elimination in time of this class of service.

During the discussion it was disclosed that under existing rate regulations 5,000 subscribers who have flat rate service for which they are paying from $72 to $125 a year could save in the neighborhood of $50,000 if they changed to the $60 measured service rate, which allows 1,200 calls a year. Professor Bemis thought the failure of the subscribers to take advantage of this rate was due to the fact that it was not generally known.

Representatives of the board of education appealed to the committee for an extension of the free service now granted the board. They asked that provision be made for free service from the board rooms to the schools, from the schools to the board and between schools. Action on the request of the board was deferred.

A Telephonically Operated Typewriter

A Unique Application

ANALYZE the physical operation of taking down dictation on the typewriter. The dictator pronounces a word, say "met," and within a fraction of a second, the letters "m-e-t" are struck upon the machine. In that brief interval of time the following interesting sequence of operations takes place:

The ear drum of the typist is set vibrating as it receives the sound waves from the dictator. Superposed upon the main sound waves are overtones of different frequency, one characteristic overtone for each letter of the word. These waves are communicated to a set of fibers in the cochlea or internal ear. There are many thousands of these fibers, each tuned to vibrate to its own individual frequency. Three of these fibers are then vibrated more strongly than the rest, one after the other, to correspond with th "m-e-t" sounds, and the excitation of these fibers is communicated to the brain, which in turn controls the muscles of the typist's fingers, causing them to strike the corresponding keys on the typewriter. No complicated mental processes need be involved in the operation. It is quite mechanical. Indeed, the typist may have been and probably was thinking of something quite foreign to the subject. But if the system is mechanical, why does not some one build a mechanical substitute for the typist, so that the dictator may control the machine by voice, without a human intermediary?

Mr. John B. Flowers, a young electrical engineer of Brooklyn, has actually made the attempt, and with a considerable measure of success. In his apparatus a telephone diaphragm takes the place of the human ear drum; instead of the fibers, he employs a set of steel reeds, respectively tuned to the different overtone frequencies of the alphabet; for nerves he uses electric currents, and for the human hand a bank of solenoids.

A diagram of the arrangement is shown in Fig. 2. When a word is spoken into the transmitter, the field of the electro-magnet *B* is varied in accordance with the sound waves impressed on the diaphragm of the transmitter. There are four electro-magnets *B*, and each is fitted with eight reeds; but for purposes of illustration and for the sake of simplicity, we have shown only one of the magnets and a single reed *C*. Although the reeds are tuned to different wave frequencies, they are all vibrated more or less by the variations in the field of the electro-magnet. But as each letter sound is uttered, the reed that is tuned to that particular letter vibrates more strongly than the rest, and closes the circuit of the corresponding relay magnet *D*. This closes the switch *E*, actuating the solenoid F to pull down the key of the typewriter.

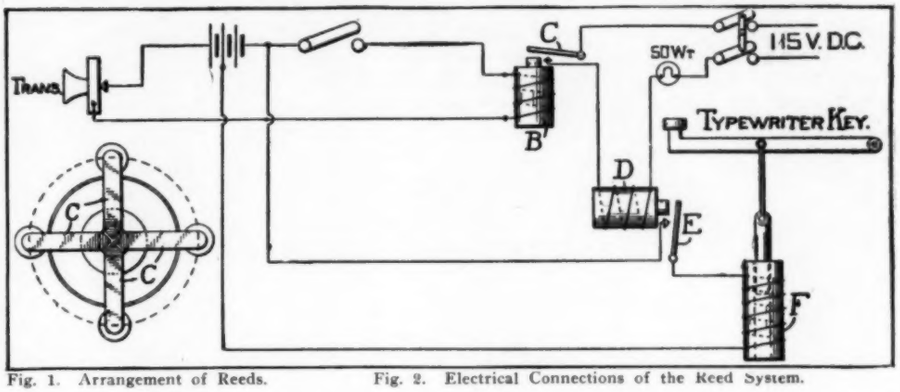
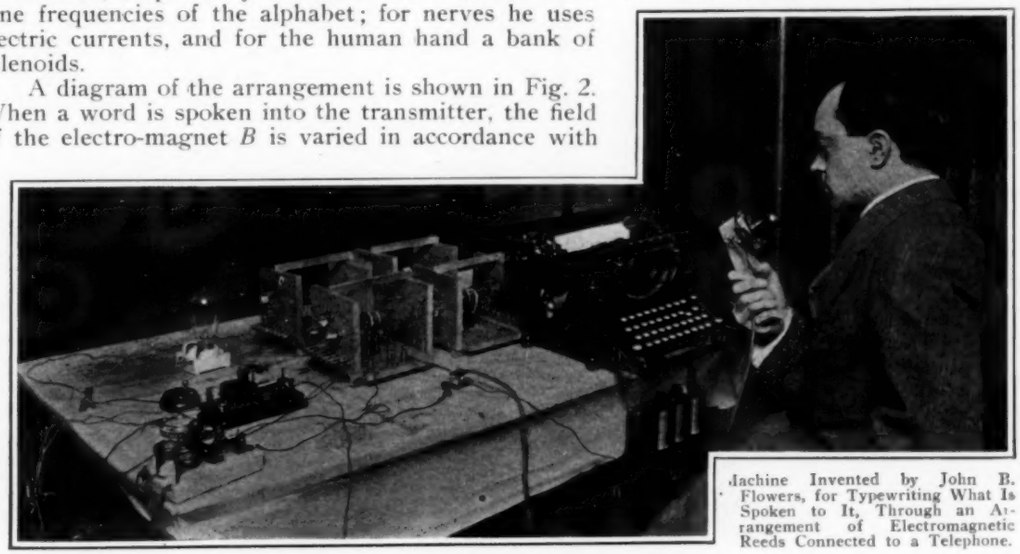


Fig. 1. Arrangement of Reeds.

Fig. 2. Electrical Connections of the Reed System.

The electro-magnets *B* are virtually telephone receivers and the reeds *C* are their diaphragms. Fig. 1 shows how the reeds are mounted at each end of the magnet *D*. It is as if the diaphragm of the receiver had sectors cut out of it, leaving a cruciform diaphragm mounted on standards at the four extremities and separated into four reeds by cutting it apart at the center. It is evident that these reeds would vibrate more or less according to the sound, just as a telephone receiver diaphragm would.

With this crude apparatus, which is shown in the accompanying photograph, the inventor has succeeded in recording on the typewriter all the vowels and the consonant "P." The consonant sounds are much more difficult to reproduce for the reason that they are of shorter duration, and any mechanical device such as a reed would be too sluggish to respond to them. However, the inventor expects to overcome this defect by using electrical resonators in place of reeds. The ar-



Machine Invented by John B. Flowers, for Typewriting What Is Spoken to It, Through an Arrangement of Electromagnetic Reeds Connected to a Telephone.

rangement is shown in Fig. 3. In this case the transmitter circuit connects inductively with the resonator mains *H* and *I*, across which are connected resonant local circuits each comprising a balanced inductance *K* and capacity *J*. On speaking the word "met" into the transmitter, the three local resonant circuits corresponding to the letters "m-e-t" are successively thrown into resonance, the current rising to a high value. A small vane of some magnetic material is caused to be pulled into the center of the coil *K* of those circuits

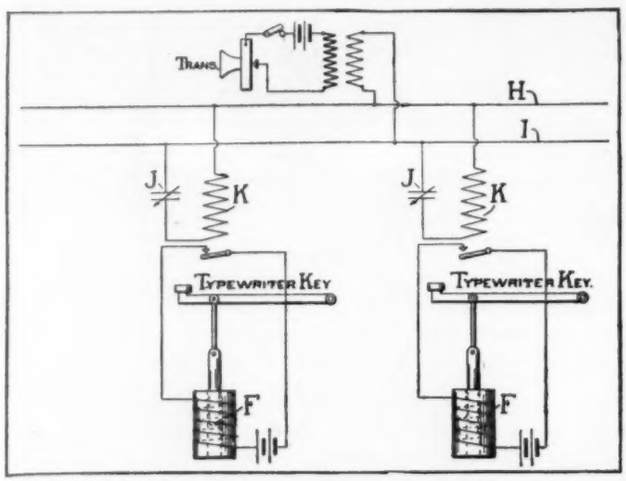


Fig. 3. Connections of Electric Resonator System.

which are highly excited, thus closing the circuits of the solenoids *F*, working the keys of the typewriter. The electric resonator system has not as yet been put to a practical test, but theoretically it should be very sensitive and quite capable of catching the overtone characteristic of the consonants.

Apparently, then, all that the dictator need to do is to speak into the ear of this mechanical typist and his words will appear neatly typed on the sheet of paper in the machine. Such a result is almost beyond credence; but so, for that matter, were many of the marvels of electric action that seem so commonplace to us today.

Telephone Extension in Texas is Great

"We look forward to the time," says Vice-President J. E. Farnsworth of the Southwestern Telegraph and Telephone Company, "when the service of the telephone will be as general for the entire country as is that of the post office. We anticipate a condition when state service by wire will be as expeditious and as common as local telephone service is today.

"The fact stands that already we reach more points directly with our lines in Texas than does the United States mail and in other parts of the country linemen and engineers are now at work bringing the Atlantic and the Pacific coasts within the radius of telephone conversation.

"We anticipate the time when postal service will be practically restricted to the delivery of packages ordered by wire and the transmission of those communications which require an original written record or are so unimportant as to leave time in transmission out of consideration.

"Today in Texas alone, with its 4,000,000 people, there are more telephones than there are in France with 40,000,000 people. There the government owns the system and does not seek business by advertising. Here we go after new subscribers and every additional name added to our lists increases the actual value of service to every other subscriber.

"In Houston alone there are more telephones than in the Balkan states, with Portugal thrown in. Dallas has more telephones in its local system than there are in the whole kingdom of Spain."

Columbus Takes Option on Company

The city council of Columbus, O., has taken the initial step toward taking over the Citizens' telephone plant for municipal operation. A resolution authorizing notification to be given the company of the intention of the city was taken from the hands of the judiciary committee, but final action was delayed on it until City Solicitor Bolin renders an opinion as to whether the city will be legally bound to complete the deal in case it gives the notice. Service Director Kinnear is also asked for an estimate of the cost of taking over the property.

The franchise of the company gives the city the privilege of buying in the property at the expiration of fifteen years, providing one year's notice of this intention is given. The fifteen-year period expires one year from next June.

City Solicitor Bolin rendered an opinion that in giving the notice the city would not be bound to purchase the property but could enter into some other agreement, if it saw fit. "The notice simply reserves the right of the city to purchase if it cares to do so at the expiration of the fifteen years."

Louisiana Commission News

An important decision bearing upon the plan of the Western Union Telegraph Company to combine its offices in Louisiana with those of the Cumberland Telephone Company, subsidiary of the American Telephone and Telegraph Company was handed down by the Louisiana Railroad Commission with the issuance of an order authorizing such consolidation at Jeanerette, La. This was a test case and was followed by the announcement that the offices of the two companies would be consolidated at other points in the state.

It was argued before the commission by complainants that the proposed consolidation was part of a scheme to eliminate competition and thereafter increase telegraph rates. The commission said it did not anticipate that such a proposition would result in stifling competition and added that an increase in telegraph rates would not be authorized.

Independent Directors Meet at Pittsburg

The board of directors of the United Independent Telephone Association of America, met April 18, at the Hotel Antler, Pittsburg, Pa. President J. Walter Barnes of Fairmont, W. Va., presided and it was decided to hold the next meeting at Erie, on July 6, when the Western Pennsylvania Independent Telephone Association convention and the Commodore Perry centennial celebration will both be in progress.

J. F. Stockwell of Philadelphia was elected a director of the association to take the place of Charles Wilson, of the same city, who died recently. It was decided to hold the next national convention in Chicago next December.

DEPARTMENT of RAILWAY TELEPHONES

Telephones for Erie Private Cars

Some Interesting Features

PRIVATE cars of railroad officials are exceedingly busy places. The official who travels in one occupies most of the time in transacting business. This necessitates car equipment as modern as the equipment in his regular office.

The Erie Railroad Company is equipping its private cars with intercommunicating telephone systems which are similar in effect to those used in business offices and factories. President Underwood's car, No. 999, was the first one to be equipped. It has a system of six stations interconnecting the staterooms, observation room, stenographer's desk, and the kitchen. A conversation may be carried on between any two of the telephones, and orders transmitted, without either person leaving his place.

All That Remained of the C., H. & D. Bridge at Hamilton, Ohio, After the Flood.

The apparatus used was furnished and installed by the Western Electric Company. The telephones are hand sets, each equipped with a cord and plug. Jack plates are mounted on the car wall, each having a push button and jack into which the plug of the hand telephone is inserted. When not in use the plugs are withdrawn and the hand sets are stored away. The different stations are called by means of a buzzer system. The call buttons are arranged on a dial plate and the system is so wired that only the buzzer at the telephone wanted is rung. The ordinary wall or desk telephones would not give satisfactory service on moving trains. They would be satisfactory as long as the train was at a standstill, but as soon as in motion the vibration of the wheels upon the rails would be carried to the transmitter and the resulting noises completely drown the telephone conversation. The use of hand sets obviates this difficulty, as the body acts as a shock-absorber.

The telephone system is also arranged for making connections with an outside telephone line so that local or long distance calls may be had from the car. The signaling current for calling the telephone exchanges is obtained from an interrupter operated from batteries.

Other private cars on the Erie system will be equipped as rapidly as it is possible for them to be called in from active service long enough to complete the installation work. These intercommunicating telephones make complete the convenience of the private car.

Through this and other uses where conditions make it preferable, the hand set is gradually coming into its own. Where absolute flexibility is desirable, as in this car, interior work, it is far better than either of the standard and conventional types of instrument, and to some extent is being adopted even in office work. The user of a private car hand set finds no inconvenience in adapting himself to the new method, and, indeed, generally declares it to have many advantages. The time may come when the hand set is used more commonly than the wall or desk set in other work besides that of the railway telephone. There is considerable resistance to change in the well established methods of commercial telephone service. But railway telephony is changing some of them.

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical development, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

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More Telephones on the C. & O.

In continuance of their policy of increasing the telephone equipment on their lines, the Chesapeake & Ohio Railroad officials have placed an order with the Western Electric Company for the apparatus necessary to equip another division of road with telephone train dispatching facilities.

The section of the road to be equipped is familiarly known as the Big Sandy division and operates in the eastern part of Kentucky in the Cumberland mountain region. The telephone train dispatching circuit covers the entire section, a distance of approximately 135 miles and extends from Ashland, Ky., to Elkhorn City, Ky. The dispatcher will be located at Ashland.

Western Electric No. 102 type selector sets arranged for local battery use will be used at way stations for receiving the dispatcher's signals. These selector sets contain the widely used No. 50 type selector. Twenty-eight way stations will be equipped with selective signaling and talking apparatus.

Ohio Commission News

The Wellington Telephone Company is authorized by the Ohio Commission to issue its 6 per cent demand notes of the total face amount of $7,000, to be sold for not less than par.

The People's Telephone Company, of Geneva, Ohio, is authorized to issue $15,000 capital stock, to be sold for not less than par.

The Farmers' Telephone Company, of Sidney, Ohio, is authorized to issue its capital stock of the par value of $11,840 and its 6 per cent mortgage bonds of the par value of $10,000, to be sold for not less than par, the proceeds to be used for the construction, completion and extension of its system and plant for the furnishing of telephone service.

The Athens County Long Distance Telephone Company is authorized to sell to the Athens County Home Telephone Company all of its property and assets, consisting, principally, of a telephone toll line extending from the central exchange of the Athens County Home Telephone Company, in the city of Athens, to the village of Stewart, Athens county, Ohio, and the Athens County Home Telephone Company is authorized to purchase said property for $6,000.

Telephone Merger Postponed a Year

The consolidation of the Home and Hudson River telephone exchanges into the New York Telephone Company exchange, which was scheduled to be made in Albany and Rensselaer May 15, has been postponed indefinitely because of the intended improvements, such as the new telephone exchange to be erected on State street at Park street, and the consequent necessary changes of the conduit systems about the city. It is not likely, according to statements made by officials of the company, that the consolidation will take place within another year, if even then.

The recent determination of the New York Telephone Company to erect a large office and exchange building on State street at Park street brought about the change in the scheduled time for taking over the Home telephone stations to the New York exchange board. There are more than 2,000 Home stations in the Albany district, which includes Rensselaer, and for some months work has been in progress arranging the switchboards to take care of these in conjunction with the 15,000 Hudson River stations already in operation. This work of arranging the switchboards will be continued and will be used to map out the new switchboards when installed in the new building. So far as actual cutting over of the two systems into one is concerned, the local officials do not expect that it will take place until it is done once for all in the new building.

Asks Commission to Fix Rate

Mayor Hitchcock of Mitchell, S. D., is in receipt of a communication which states that the Dakota Central Telephone Company has applied to the state board of railroad commissioners to fix a telephone rate to be applicable in Mitchell after the expiration of the present franchise on May 11. The law gives the commissioners the power to fix rates in case of a controversy which cannot be settled, but the fact that the franchise will have expired in this city and that the company, if granted new rates by the commissioners, will be operating without a franchise, makes it doubtful, so lawyers here state, if the board would have jurisdiction in this case. It is generally conceded that the new rate, which the board will name, will be higher than the one now in force. It has been intimated that the majority of the people of the city will take out their telephones if the rates are raised and will thus support the stand taken by the city council. At any rate, all the telephones in all the city offices and buildings will be removed on May 11, including all fire alarm telephones and a new and independent electric fire alarm system will be installed.

Overwork Emergency Amendment Voted Down

Vice-President J. E. Farnsworth of the Southwestern Telegraph and Telephone Company, Austin, Texas, declared that the action of the lower house of the legislature in voting down the amendment giving telephone operators the right to work over nine hours a day in emergency, would make practically impossible real service under such conditions as now prevail in flood and storm-stricken portions of the United States.

"By a vote of sixty-seven to fifty-four," he explains, "the house voted down the proposed amendment to the so-called nine-hour law.

"This action by the house was taken in the face of reports from the flood-stricken sections of the country where such emergency now exists as we may be called upon to face any day. This provides the example and the question of giving telephone service demands serious consideration. In Texas 629 telephone companies are anxious to prove themselves of more than ordinary benefit to the subscribers and the public in general.

"The corporation which breaks the law in small things will break the law in great things and we have not adopted the policy of tracking the statutes. We will obey such a law as is proposed if it is held to be to the public advantage to have a statute of this character."

The Oklahoma Corporation Commission has ordered a suspension of its order in regard to physical connections between telephone companies at Cherokee, which was to have become effective April 8, and on request of the companies affected will give a further hearing on the matter.

The Union Pacific's New Building

Telephone and Telegraph Equipment

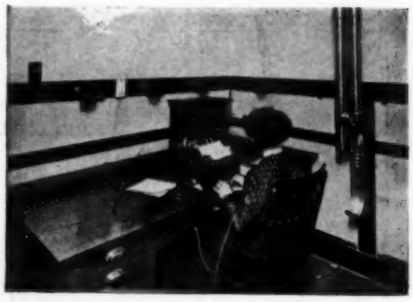
New Headquarters, Omaha.

THE general departments of the Union Pacific Railroad Company have taken possession of their new home in the recently completed general office building in Omaha, Nebraska, and are now housed in a manner befitting the magnitude of the company's operations.

The building, which is located at the northeast corner of Fifteenth and Dodge streets, has twelve stories and a basement. It is 173 feet high, with a frontage of 199 feet on Dodge street and 146 feet on Fifteenth street, with a 50-foot court in the rear. The construction is of the most modern skeleton steel frame-work type, with polished concrete floors and tile partitions, rendering the building thoroughly fireproof. Maine granite is used for the base, the exterior of the first three stories is of Bedford stone, while the upper stories are of gray pressed brick with terra cotta trimmings of the same color. Interior fittings are of Colorado marble and early English finish oak. The entire building cost approximately $1,400,000.

All the modern conveniences and necessities to be found in the modern office building have been installed. The equipment includes seven electric passenger elevators; one electric freight elevator; a filtering and refrigerating plant for furnishing pure and cool drinking water throughout the building; a vacuum system for cleaning without raising a particle of dust; a sprinkled air (warmed in cold weather) ventilating system; thermostat heat regulation in all offices, and automatic fire pumps.

Throughout the building, there are a number of vaults used by various departments for current files. Besides these, there are also forty-eight commodious, well-ventilated and well-lighted fireproof vaults in the basement for safeguarding the permanent records.



One of the Telephone Message Rooms.

The first department to occupy the new building was naturally the telegraph department, which had been engaged in designing and perfecting the arrangement of the new equipment and overseeing its installation.

The superintendent of telegraph, J. B. Sheldon, who has been in charge of the telegraph and telephone lines of the Union Pacific for a number of years and has been the moving spirit in promoting the general efficiency of the personnel under his supervision, has had the direction of the work entailed by the transfer to the new quarters. It is probably due more to his executive ability and zeal than to any other factor that a high standard of efficiency has been maintained at all times on the telegraph and telephone lines of the road. It is also due to his foresightedness that all of the equipment installed is of the most modern obtainable. Mr. Sheldon is fortunate in having under him a capable staff, consisting of A. O. Nicholas, chief clerk, John Hilbert, engineer, and P. F. Frenzer, manager in charge of local operations.

The telegraph department is centrally located on the fourth floor, facing Dodge street. The superin-

P. F. Frenzer, Local Manager.

A. O. Nichols, Chief Clerk.

J. Hilbert.

tendent's quarters comprise private offices for the superintendent and chief clerk, and a well lighted and well arranged general office, with approximately 2,300 square feet of floor space.

The telegraph operating room is 53 feet square, affording ample space for present and future requirements. A commodious locker room adjoins the main

Telegraph Operating Room.

office, while lockers are placed near the telegraph tables for the telegraphers' typewriting machines. All furniture and fittings are new and in harmony with the woodwork finish of the building.

Cables and wires are brought into the telegraph office and to the telegraph tables by a complete and comprehensive conduit system, consisting of pipes of various sizes. Approximately 25,000 feet of rubber covered wire is laid in these conduits, extending from the distributing frame to operating, repeater and multiplex tables. This is sufficient to care for all present and future connections.

In addition to the conduits within the office, there are three 2-inch pipes leading from the office distributing frame to the wire shaft, extending up and down between floors, for the main cables coming in from the outside underground; and also three similar pipes leading to the telephone terminal room to carry cables or wires from the telegraph office to other locations in the building.

The operating tables are of solid quartered oak, quartette style, and of special design. Drawers are provided on each side for the various kinds of blanks; and a wire runway extends lengthwise underneath leading to and connecting with the floor conduit, thus affording a convenient and satisfactory way of taking care of instrument wires.

The repeater and multiplex tables are of the standard American Telephone and Telegraph Company pattern and have been furnished by the Western Electric Company, which also furnished the entire equipment of telegraph and telephone apparatus.

The switchboard is a combination telegraph and telephone Morse board design with special features to meet the Union Pacific's conditions. The present capacity of the board is for 40 wires, each carried through 11 jacks. Six are used for making tests and patches in the test panel. The other five are in the Morse panel and are used for cutting in loops to outside offices. Telephone jacks are also provided, the circuits being composited. Composite, simplex or phantom coils may be connected direct to jacks while the leg from each duplex set to operating table is carried through four jacks which have a high insulation resistance value. Four sets of Morse instruments are located conveniently for testing purposes. Under normal operating conditions the board is entirely free of cord and plug connections.

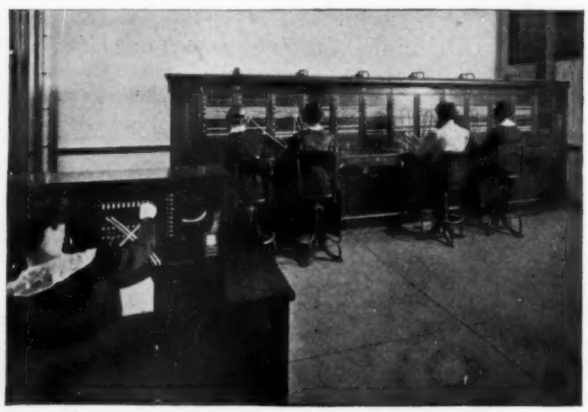
A double scale voltmeter, a combination milammeter and voltmeter, a wheatstone bridge and a galvanometer together with keys, jacks and plugs complete the equipment required in testing and locating trouble.

The distributing frame, located back of the switchboard, is of the No. 1420 Western Electric type with an ultimate capacity of 100 lines and 600 pairs of terminals for local wiring. No. 4-A protectors, which are a combination of heat coils and carbon cut-outs are used.

The coil rack for composite, simplex and phantom equipment is located to the right, back of the switchboard, while a slate base panel is also provided adjacent to the switchboard for resistances, fuses and "time" relays. Sixteen time repeater relays are installed, each with contacts for operating two "time" circuits. The contacts are brought out on cords and plugged in at the switchboard at the "time" set for sending out time signals over the entire road each day to all offices and for regulating electric clocks at division and district terminal points.

Adjoining the telegraph operating room are two sound-proof telephone message rooms used for handling messages by composite telephone service. The equipment consists of a table of special design used in connection with a composite switchboard having a capacity of 18 lines. By means of a key, the operator can cut any line through to the private branch exchange for long distance connections.

A pneumatic tube system consisting of approximately 17,000 feet of three-inch tubing was installed throughout the building by the Universal Pneumatic Transmission Company of Chicago, Illinois. It connects with each department and with a central station in the southeast corner of the telegraph room. In and



Private Branch Telephone Exchange.

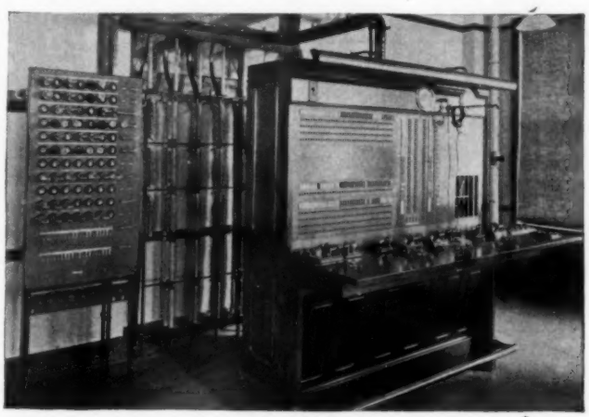
out tubes are provided for each of the thirty-six pneumatic tube stations.

The system is used principally for handling messages to and from the telegraph office, but also serves in delivering correspondence and memoranda from one department to another by transfer carriers at the terminal station.

The pneumatic system is operated on the vacuum principle, the power being derived from a ten horsepower fan motor having a maximum speed of 3,450 revolutions per minute. At top speed it energized the movement of the leather carriers through the tube at the rate of 90 feet per second. Each line is automatically controlled by a globe valve which shuts off power when the line is not in use. Inserting a carrier, opens the valve and allows the air to flow while delivery of a carrier closes the valve and shuts off the air.

The private branch telephone exchange occupies a room on the same floor and adjoining other offices of the telegraph department. Connecting with it is a comfortably furnished rest room for the telephone operators.

There are 251 local telephones connecting with the exchange as well as four long distance composite lines.



Morse and Test Switchboard.

A chief operator and six operators are required for the operation of the switchboard. Service is continuous day and night.

Adjoining the telephone exchange room is a well lighted and well ventilated room in which are installed the terminal frame, storage battery and charging plant used in connection with the telephone exchange.

The Union Pacific officials in equipping their new general headquarters have spared no expense in bringing together every modern device which could in any way aid in facilitating the work of the various departments and so guarantee a high efficiency for the entire organization. A policy such as this is always profitable in the end, though the initial expense involved may be great, inasmuch as modern time and step saving devices pay for themselves many times over in a comparatively short time in increasing the work capacity of the employes, both rank and file. The well lighted and well furnished offices are also an evidence of the company's desire to make the employes' surroundings cheerful and inspiring. In fact, the new headquarters provide a distinctive model for others to follow from every point of view.

The Western Electric Company, which distributed large quantities of Washington fir cross-arms, reports that the demand for this high grade material is constantly increasing. Telephone companies and electric light companies appear to be becoming convinced that the permanency of construction afforded by these fir arms warrants the small additional initial investment.

To Reorganize T. and T. System of Uruguay

A reorganization of the national telegraph and telephone system of Uruguay is about to be undertaken by the government. The Executive is authorized to contract with the Bank of the Republic a loan of 380,000 pesos ($392,920 U. S. currency) for this purpose.

Among the contemplated extensions and improvements are the construction of a line between Salto and San Eugenio, on the border of Brazil, in the Department of Artigas, a reconstruction of all national lines so as to make them "weatherproof," and placing underground the national telegraph wires in the Department of Montevideo. Iron or steel poles are to be employed, and the wires will be used for the simultaneous transmission of telegraphic and telephonic messages.

The Board of Posts and Telegraphs (La Dirección General de Correos y Telégrafos) has been authorized to call for tenders for the materials needed for the projected improvements. Propositions for the work of burying the cables in Montevideo have been submitted by the German firm, Siemens & Halske, la Sociedad Italiana de Conductores Eléctricos, of Livorno, and the firm of Perelli & Co., of Milan.

Consul B. M. Rasmusen, of Bergen, Norway, reports that the contract for installing a new telephone exchange in the city of Bergen was awarded on March 18 to the Western Electric Company of New York, for $201,000.

Police Signal System for Des Moines

Arrangements were completed at a recent meeting of the telephone company officials with Councilman F. T. Van Liew and J. W. Jenney, chief of police of Des Moines, Iowa, for the installation of the proposed police signal system. The installation will be made by the Iowa Telephone Company and a new switchboard will be placed at the central police station, through which the signal system will be handled.

There will be twenty-five telephone stations located in the business district of the city, each equipped with a large bell and electric light to summon the patrolman on the beat when wanted. The fourteen patrol stations now in use will be connected with the central switchboard, also. The cost of the system to the city will be $750 per year.

Telephone Company to Advise Motorists

The Mountain States Telephone & Telegraph Company will keep motorists advised as to the condition of the roads in the state of Colorado during the summer, according to a plan devised by President E. B. Field. The company's lines in most places follow the motor roads and daily bulletins will be posted in the company's offices on the roads in various neighborhoods.

Hutchinson Firm Buys Telephone Number

Although telephone numbers ordinarily are not regarded as property to buy and sell, a new firm in Hutchinson, Kans., recently paid $40 for No. 1. G. C. Curtis had telephone No. 1 for a number of years. The new firm, which bought his telephone number advertised that it would pay $25 for a low number, and then hunted up the holder of No. 1. Mr. Curtis refused to sell his right to this number for $25, holding out for $50. A compromise was effected on $40.

Of Interest to the Trade

By A. L. Haase

Novel Use for Guy Anchors

The floods of southern Illinois, Indiana and Ohio destroyed an enormous amount of telephone equipment, to say nothing of the general damage to property. The railroads were among the heaviest losers, and also, naturally, among the first to become active in the work of restoration. One line, the Louisville & Nashville, in its eagerness to get its right of way into shape again, contributed incidentally a novel and convincing proof of the holding power of Matthews' guy anchors. Let Claude Matthews and his kodak tell the story:

Moving an Anchor to a New Location.

Late Saturday afternoon, April 5, 1913, we were called on the telephone by the local office of the L. & N. R. R. Company and asked if we could put twelve 8-inch Matthews guy anchors on train 51, leaving St. Louis at 8:34 Sunday morning. We said we could and the order was given us. We asked them what purpose the anchors were wanted and got the reply that they had something to do with the overflow of the Wabash river at Maunie, Illinois. This information was not very illuminating, so the writer decided to take his Kodak and go with them.

The Track Pulled Back Into Place.

The pictures shown were taken on Monday, April 7, and the description tells the story after the following explanation:

Over a mile and a half of track was up-ended along the Western Union poles by the flood and looked like a paling fence. When the waters receded sufficiently to permit the use of hip boots the repair gang under the charge of A. H. Snellen, Louisville, got busy and started to pull it back on the right-of-way.

They screwed the twelve 8-inch Matthews guy anchors down, one about every fifty feet, and at an angle of about 45 degrees. These anchors were screwed down under the water (which was from eighteen inches to three feet deep and running five or six miles an hour) until the eyes were down to the ground. Eight-inch, three-sheave blocks were attached to the eyes of the anchors and to the track. Ten to fifteen men pulled on the fall line. This was sufficient to "roll" and pull the track back on the right-of-way. As fast as the track was replaced the anchors were unscrewed and taken on ahead (as shown in one of the photographs) and screwed down.

Mr. Snellen told the writer that the best previous rate of progress under similar conditions that they had been able to make was about 600 to 700 feet a day. With these 8-inch Matthews anchors they progressed at the rate of over 1,500 feet a day. The writer could not get any hip boots in Maunie, so he could not get any photographs of the men screwing down the anchors.

Pulling Against the Anchors.

Automatic System Adopted by Buffalo Company

One of the most notable telephone events that occurred during the past month was the decision of the Federal Telephone and Telegraph Company of Buffalo, N. Y., to install a complete 17,000-line automatic plant, manufactured by Automatic Electric Company of Chicago, in its Buffalo exchanges.

This action was taken after a series of investigations extending over a period of more than a year, "with results," says President B. G. Hubbell of the Federal Company in announcing the projected change to the subscribers, "that completely justify the Federal Company in offering its own personal guarantee that the automatic will do all the manual system will, and much more."

Mr. Hubbell further states that: "Our company has adopted it more particularly, however, because of the unanimous approval of the apparatus by a very large number of telephone users who have examined the exhibit in the last two months. Without a single exception the hundreds and thousands of people who have visited this exhibit and who have had explained to them the

marvelous mechanical features and the wonderful convenience of operation and economy of time in the use of it, have expressed their wonder at the completeness of it and have strongly urged the Federal Company to adopt it for the use of the Buffalo people.

"As soon as plans are entirely finished work will be started and it is hoped that by January next the entire Federal system in Buffalo will be working with automatic apparatus.

"No inconvenience will be noticed by the subscriber in making this change. The automatic dial will be attached to the present telephone and when the plant is fully established the system will be cut over in a minute's time and the subscriber can make his next call by the automatic.

"Buffalo will be interested to know that this change from manual to automatic is in line with the telephone progress of the world and that similar changes are being made in almost every country. In no place, however, has so stupendous a task been attempted as this that has been assumed by the Federal Company. A great corps of technical men will be used in making the change and the attention of the whole telephone world will be centered on Buffalo while this great engineering feat is in progress."

One of the largest independent telephone companies in the world, the Federal stands supreme today in Western New York and Pennsylvania. Besides operating its Buffalo system the Federal Telephone and Telegraph Company has exchanges, or own controlling interests in exchanges in 75 cities and towns in western New York and Pennsylvania, giving it a total of more than 65,000 subscribers and a service that covers the entire Buffalo "Business Area," a region bounded on the east by the Syracuse zone, on the south by the Pittsburgh influence, and west and north by the Great Lakes.

In 1901, when the Federal Company (originally the Frontier Telephone Company), entered the field, there were about 6,000 telephone subscribers in Buffalo. The equipment was antiquated, the service poor, and the rates high. Starting with a 5,000-line installation, the independent company's plant in Buffalo has grown to about 22,000 subscribers. Its equipment is of the most modern manual type and practically all the main cables are carried in conduits.

Besides its telephone affiliations, the Federal Telephone and Telegraph Company owns the Century Telephone Construction Company, one of the independent manufacturers of telephone apparatus.

The preliminary plans for the automatic exchanges provide for an installation of five main offices and two branch offices. Connecting trunks will be installed from each main office to all of the other main offices, while the branch offices will have trunks only to one of the main offices, connections from the branches being made over the trunks of the main office in which the branch trunks terminate. The initial layout will be for 17,000 lines.

The present Buffalo system is operated principally from one office so that the sub-division into a number of offices located in various telephonic centers will greatly increase the cable capacity, as it will be possible to cut the present cables into the new offices and thus allow them to feed from two directions.

On account of the sub-division of the system the length of subscribers' lines will be greatly reduced, which will make a marked improvement in the transmission; the average length of lines will probably be less than one mile.

By the installation of automatic equipment the service will be further greatly improved since the calling rate of the present system is extremely high, averaging over 20 calls per line per day, a traffic impossible to handle with any degree of efficiency with a manually operated system.

It is proposed to install the outlying exchanges at the earliest possible moment in order to provide facilities for the immediate demands in those districts, and the present main exchange will be the last to be cut over to automatic.

The Follow-up Retort

W. N. Matthews & Brother, fourth city boosters and specialty advertizers, believe in the constant gnaw of touser. In their scheme of follow-up letters to the telephone trade, they dwell at length on guy anchors and clamps. In a more recent letter—the hopelessness of getting a rise, sentiment brought this reply from A. L. Bigelow, superintendent of the Ashville Home Telephone Company, Ashville, Wisconsin:

> Like unto a frog in a bog, the chill of winter renders us voiceless. The mire of inactivity chills our blood, stiffens our sinews, paralyzes our vocal chords and minimizes our energy.
>
> When the warm sunshine of springtime causes the red corpuscles of our blood to leap and bound, we trust the ice of despondency will melt away, that the roots of our little plant may germinate and spread out, making it possible to bear us more and larger fruit; then, frog-like, we hope to cheep, for we are thoroughly convinced of the strength of your giant and also of the pure and innocent power your Baby would have in our "Home."
>
> We trust that we will be in a position before the summer passes to test the strength of the "Big One," and to play with the "Little One" to our hearts content.

Portable Wheatstone Bridge Test Set

The new Type S portable Wheatstone bridge testing set, which was exhibited and very favorably commented upon at the Chicago convention of the National Independent Telephone Association is now being placed upon the market by the maker, the Leeds & Northrup Company, of Philadelphia. With this instrument resistance measurements may be made throughout a wide range. It is especially designed, however, for use in locating grounds, crosses, etc., in telephone and telegraph lines and cables. The principal features of the set are low price (this without any sacrifice of standard Leeds & Northrup quality), small size, light weight, convenience of manipulation and sensitivity of the galvanometer.

The instrument is shown in the accompanying illustration. Its dimensions, when closed, are 7⅜x8¾x4½ inches. Its weight is only eight pounds.

The resistances in the set are all controlled by dial switches. All contracts are within the box and therefore protected against dust and dirt. These contacts are easily accessible for inspection. The contact switches are made up of several "leaves" of phosphor bronze, each making independent contact. The switches have been very carefully designed and constructed and no fear need be entertained of trouble being caused by their failing to make good contact.

The switch contacts are controlled by rubber heads on the top of the box. These heads present surfaces which are entirely rounded so that the operator's fingers

are not made sore after continued use of the instrument.

The ratio coils are controlled by one dial, thus eliminating a source of confusion which exists in other testing sets in which two dials or two sets of plugs are used for the control of the ratio coils. In the latter type of sets the two arms are commonly termed *A* and *B* arms. Very often an inexperienced operator, and sometimes an experienced one is at a loss to know whether the ratio to be used is *A/B* or *B/A*. With the arrangement used in the Type S set, the ratio dial always gives directly the value of the multiplier.

The accuracy of adjustment of the coils in this set is as high as in the more expensive bridges, namely 1/10 per cent in the rheostat and 1/20 per cent in the ratio. These figures are guaranteed. As a matter of fact the coils are all adjusted in the laboratories of the makers to twice the accuracy stated above. An important feature in connection with the resistance coils is the fact that

The New Dial Decade Set.

they are all wound upon metal spools. This not only makes the coils more permanent in their adjustments, but also protects them against being burned out, as they can carry heavier currents than coils wound upon wooden spools.

The galvanometer is the new Leeds & Northrup interchangeable type. It is guaranteed to have a sensitivity of one megohm. This means that one volt impressed across the terminals of the galvanometer through a resistance of one megohm produces a deflection of one millimeter. The moving system of the galvanometer is contained in a separate unit which may be readily removed from the set should repairs ever be necessary. The galvanometer is exceptionally rugged, however, and will withstand considerable rough handling.

A battery of four dry cells is contained in the set. Should it be desired to use an external battery, the internal battery may be thrown out of circuit by means of a small switch and the external battery connected between posts provided for the purpose. Similarly, an external galvanometer may be used, if desired. Switches are provided for changing the internal connections of the instrument permitting the set to be used for resistance measurements or for the Murray or Varley loop tests.

For the advantage of those not thoroughly acquainted with the methods of locating grounds, etc., on lines and cables, we give an example of using this set in such work. We will assume that a conductor in a cable 8,995 feet long is grounded. A second conductor is chosen from the cable, this conductor being clear. The good and bad conductors are then joined at the opposite ends of the cable. The free ends of the conductors are now joined to the posts on the instrument marked X_1 and X_2. The two small double throw switches are set for the Murray loop test, which we will use in this case. The ratio dial is set at the point marked M 1,000 and the rheostat is then adjusted, so that there is no deflection of the galvanometer. Suppose the rheostat reading to be 450. Then

Distance to fault $=$ *2 x length of cable x rheostat reading.*

$$\text{Rheostat reading} + \text{ratio dial setting.}$$

$$= \frac{2 \times 8{,}995 \times 450}{450 + 1{,}000} = 5{,}583.1 \text{ ft.}$$

If the length of the cable is not known, the resistance to the fault is found just as easily as the distance in the above example. The distance is then determined from the resistance, and the resistance per foot of the conductor under test as determined from a wire table.

Faults may be just as readily located on overhead lines provided there is available a good conductor paralleling the faulty line.

The maker fully describes the Type S set in Bulletin No. 530.

Axle Lighting Equipment

The Atchison, Topeka & Santa Fe Railway Company, has recently ordered from the Electric Storage Battery Company, 62 axle lighting equipments. The Electric Storage Battery Company has for some time been developing a new axle lighting outfit involving a number of radical departures. The dynamo is of the Rosenberg type which has been extensively used abroad, modified, however, to give constant voltage characteristic rather than constant current. The field excitation is controlled by a Wheatstone bridge combination of circuits without any moving parts or contacts. The inherent characteristic of the Rosenberg type of machine which gives the same polarity for either direction of rotation eliminates the necessity for any pole changer. The variation in voltage is reduced to narrow limits and no lamp regulator is required. The system adjusts itself automatically to different conditions of load produced by variations of schedule or by change of season so that no manual adjustment is required to meet these different service conditions. At the same time useless overcharge of the battery is eliminated establishing conditions favorable to long battery life. The decision to place this order with the Electric Storage Battery Company was based on the results of a test of this system begun last fall by the Santa Fe Railway Company. The equipment which was put in service for the purpose of demonstration has now made over 60,000 miles without a failure, and the result of this demonstration has been most gratifying to the railway company and to the manufacturer.

Automatic's New Publicity Department

A new department, that of publicity and advertising, has recently been established by the Automatic Electric Company of Chicago and N. P. Bartley has been placed in charge of it.

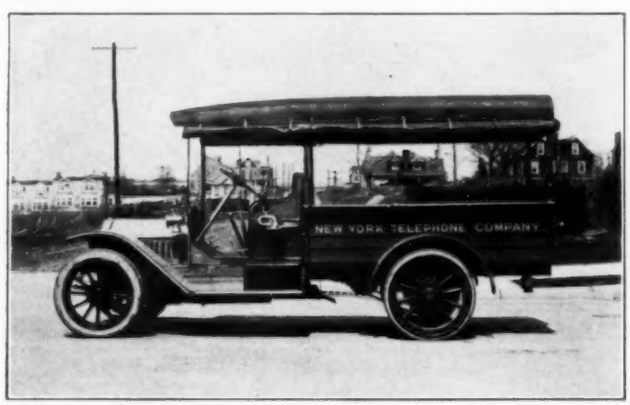
Mr. Bartley is a newcomer in telephone circles, having previously been in newspaper work. He spent some time in the Civil Service of the Philippines Islands, and had an opportunity while there of studying economic and public utilities problems in that country. Later Mr. Bartley was engaged in journalistic work in various capacities, and resigned his position as assistant Sunday editor of the Buffalo, N. Y. *News* to assume his new duties.

The Automatic Electric Company announces that the aim of this new department will be not only to bring to the attention of the telephone public the advantages of automatic telephony, but also to assist in every way possible the independent telephone interests of America.

TELEPHONE ENGINEER desires to congratulate both Mr. Bartley and the Automatic Electric Company upon this new connection and extends its sincere best wishes for its success.

The International 1,500-Pound Motor Wagon

The International 1,500-pound motor wagon, which has just been added to the International Motor Company's other nine sizes of motor trucks, represents the accumulated experience of eighteen years manufacture of motor trucks of known value and 8,000 trucks in active service all over the world. The engineering knowledge gained from years and years of building gasoline trucks—knowledge which cannot be bought at any price—gives the International Motor Company a position



International 1,500-Pound Truck.

of offering in the new addition to its large and well-known line of Mack, Saurer and Hewitt trucks, a light delivery vehicle in which is embodied the design and workmanship of seasoned experts. In refinement of design, in performance, in economy of operation, in durability, in serviceability—in all that a good light truck should be—the International 1,500-pound wagon is excellent. Every practical feature; every point which can make for successful operation that could be desired by the most critical has been incorporated in this latest addition to the International family of commercial motor vehicles.

The motor—the most vital feature of the chassis of a commercial motor vehicle—is efficient, economical and quiet in operation, has large reserve power for emergencies, unit type of design, enclosed pressure system of lubrication, enclosed valves, over-sized bearing surfaces and three point suspension. Long life for the motor and freedom from troubles incident to vibration are greatly augmented by the use of pneumatic tires on the front wheels. The unit type transmission with four speeds, remarkable accessibility of every working part, straight line drive, which reduces frictional losses from motor and rear wheels to the smallest possible amount, long under-drive and semi-control, flexible spring suspension permitting the carrying of delicate materials without damage, greatly over-sized tires on the rear wheels, exceptionally large braking surfaces, these are but a few of the distinctive features of this motor wagon. The extraordinarily light weight chassis, gained by the use of the finest steels; the use of material in its construction which is largely made according to the engineer's special formulae, insures the purchaser of the International 1,500 pound motor wagon, a vehicle of long life and the highest degree of reliability of operation.

New Automatic Exchange in Australia

Word has just been received from Melbourne, Australia, that the federal government has decided to convert the exchange at Brighton from the manual type to the automatic apparatus manufactured by the Automatic Electric Company of Chicago. Brighton is an important station in the Melbourne telephone district and is to be equipped with an initial plant of 1,500 lines.

This decision on the part of the Australian government marks one more step toward a general adoption of automatic equipment throughout the government-owned telephone system and was taken only after careful consideration and close observation of the automatic exchange at Geelong, which was placed in service about a year ago.

In this connection the following extract from the annual report of the postmaster-general's department to the parliament of the Commonwealth of Australia will be of interest:

> During the past year exhaustive inquiry has been undertaken into the question of automatic equipments. The visit of the chief electrical engineer to America and Europe was, in a large measure, devoted to an investigation of the questions of cost and relative efficiency of automatic versus manual telephone switching systems.
>
> The problem whether the telephone switching of the future is to be manual or mechanically performed, and, if the latter, whether to the full extent of entirely eliminating the telephone operator—except for trunk and special calls—is a highly technical and exceedingly complex one. Valuable data has been collected from other telephone administrations in America, England, Germany, Austria, Holland, etc., but Australian conditions radically differ in many respects from those existing abroad. It was, consequently, decided, as a practical experiment, to install automatic equipment in a medium-sized exchange within the commonwealth, and Geelong was selected for the trial. Full automatic working was established in the exchange on the 6th July last, and since that time close and continuous attention has been given by my officers to the working of the experiment. Much useful information as to the precise applicability of automatic systems generally, and of the system chosen in particular has been obtained. So far the results have been satisfactory.

Since the installation of the Geelong plant four other exchanges, those at Newtown, Balmain and Glebe in the Sydney district, and Perth have been ordered changed from manual to automatic and the apparatus is now in course of construction.

In addition a 500-line automatic exchange has been sold to the New South Wales Railways, making a total

of six plants having a total initial equipment of 10,800 lines, ordered from the Automatic Electric Company through its agents, Automatic Telephones, Australasia, by the Australian government during the past four months.

Western Electric Company's Annual Report

Corporations' annual reports are not ordinarily selected as entertaining reading matter; but as a commentary upon conditions in an industry upon which depends to a very great extent the successful maintenance of Bell telephone service in the United States, the annual report of the Western Electric Company for 1912 is entitled to more than casual notice.

The facts presented by the report are: A five and a half million dollar increase in sales over 1911; an increase in the number of orders and their average value; additions to manufacturing plants both here and abroad; the opening of new distributing houses; and an increase in the number of employees.

The sales amounting to $71,729,329 were not made to the American Telephone & Telegraph Company and the associated companies alone, although some people still entertain the idea that sales to these companies is the extent of Western Electric activities. The fallacy of this opinion is apparent from a statement in the report that the company has 24,000 customers other than telephone companies. This signifies wide activities in fields other than the telephone industry. The Western Electric Company "furnishes equipment for every electrical need," and sells to railroads, electric power central stations, street railways, electrical contractors and dealers, manufacturers, and now also to a limited extent through its own retail stores, to individual consumers. The line of equipment handled embraces everything electrical, from the largest generating plant to the simplest of electric household devices. The company's sales to customers other than companies of the Bell system have steadily increased during the past ten years and are in great measure responsible for the addition to the American factory at Hawthorne (Ill.) and the Antwerp and London factories abroad.

The number of employees has also increased, there now being a roll of 24,564, an increase of over 1,000 over the previous year. The report finishes with a comment on the new employees' pension and insurance system. Fifty-seven pensioners, an increase of eight during 1912, are now on the company's list, at an average annual pension of $634.

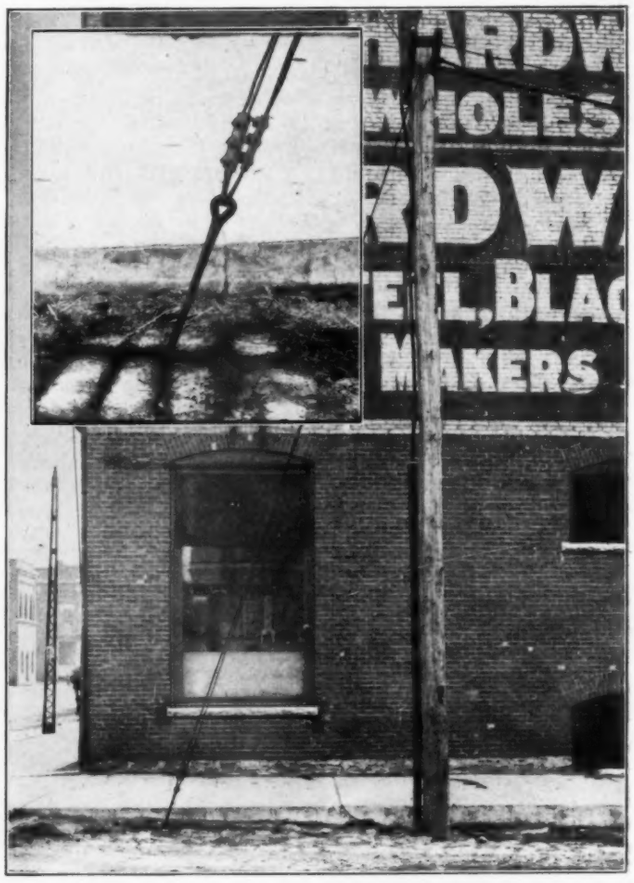
As a whole, the report breathes a spirit of optimism and prosperity and reflects the generally satisfactory condition of the telephone and allied electrical industries.

Co-operation in Warren, Ohio

In a letter to the Telephone Improvement Company from the Warren & Niles Telephone Company, Warren, Ohio, it is stated that during the recent flood in Warren, the city fire alarm system was crippled owing to the withdrawal of 500 volt power circuit from which its batteries were charged. The Warren & Niles Telephone Company, under the direction of E. G. Miller, general manager, ran a temporary wire across the street from the exchange batteries which were being charged from a temporary gasoline engine power plant and furnished the fire department with current to keep its batteries charged and in service. This was continued for a week or more.

D. & T. Anchor in Granite Pavement

The accompanying illustration shows a D. & T. anchor, made by the Vote Berger Company, La Crosse, Wis., which was installed five or six years ago on a dead ended hundred pair cable lead. Two 7/16-inch messengers were found necessary to guy the pole, which will give some idea of the required strength of the anchor. The anchor, it will be noticed, was installed alongside the curb and the pavement consisted of granite blocks, which were about six inches wide, twelve inches long and eight inches deep. Below the granite blocks was a concrete foundation. To install a dead man would have required the removal of ten stones, as well as breaking



D. & T. Anchor in a Difficult Location.

through the concrete below them. Installation of the D. and T. anchor required the removal of only one stone directly to the right of the anchor and breaking through the foundation beneath. The anchor could then be driven, the foundation tamped back and the block reset. The use of this anchor probably saved about five dollars in this case.

In reply to a question by C. S. Goldman, the British postmaster-general (H. Samuel), stated in the House of Commons that he did not consider that the management of the telephones could be separated with advantage from the management of the telegraphs, since the same buildings, poles and underground cables were largely used for both; nor was it practicable to separate the two services from the post office department.

The Restoration of Telephone Service

The test of an organization comes in an emergency such as recently arose in the vast territory from Omaha in the west to the Allegheny mountains on the east and from the Canadian line southward to the Gulf. The first unusual demands for special service came to the Western Electric Company from tornado-stricken Omaha where the telegraph and telephone lines were seriously interfered with. The company was notified that 8,000 poles, 25,000 cross-arms, 100,000 pins and 32,000 feet of telephone cables ranging in size from 25 pair to 400 pair, were immediately needed. The southern demand found the organization keyed up for a quick response and on the day the order was placed, 20 carloads of poles, 100,000 pounds of copper wire and all of the above cable went forward. The company's stock of 25,000 cross-arms at Minnesota transfer was drawn upon, the poles went forward from the yards in Michigan and the balance of the equipment from the Chicago stock.

The next call was for cable for the Chicago district, for the Western Union Company. This emergency cable, to the extent of 235,000 pounds, went forward at once by express from New York, almost every through passenger train leaving the East for Chicago up to the time traffic was suspended being pressed into service to carry its quota of this cable.

In the meantime, the floods began to make themselves felt in Indiana and Ohio where, within a few days, not only telegraph and telephone service, but electric light, street railway and railroad service was completely demoralized. Again came the call for emergency line material. First of all, the company's stocks of cable, cross-arms, wire and line construction material of every description located in its distributing houses at Cleveland, Pittsburgh, Indianapolis and Cincinnati, were drawn upon; and then the outlying houses were notified to be ready with their assistance when it was needed. Complete stocks were available at Boston, New York, Philadelphia, Richmond, Atlanta, Kansas City, St. Louis, Minneapolis and Dallas—these houses constituting a chain of reserve depots surrounding the stricken districts, while further west were the other distributing centers of the company which might also be called upon to help.

Meanwhile, it was seen at the company's executive headquarters in New York that with all these reserve stocks depleted, they must be immediately replenished. Accordingly, telegraphic orders were issued to send east from Washington, 50,000 cross-arms, and requisitions were placed upon the company's sources of supply to increase the stock of copper wire available for shipment to upwards of over a half a million pounds and for the drawing of several hundred thousand pounds of copper wire and the furnishing of from five to ten million feet of rubber covered wire and outside distributing wire.

So much for the measures taken to remedy outside plant conditions. Following the subsiding of the waters it was expected that there would be like demands upon the company for reserve telephone exchange equipment. At this writing, the first of these calls had only just begun to come, but the company was ready with men and apparatus to meet this phase of the emergency. The first call on the New York office was on the morning of March 31, when word came to move a force of telephone installers and switchboard material with the greatest possible speed to Marietta, Ohio, where the lower floors of the Bell telephone exchange building had been flooded to the ceiling, the terminal and power equipment completely submerged and telephone service entirely suspended. Before the day was over, tools and material were in transit on taxicabs to the afternoon Baltimore & Ohio express for Wheeling. With this material went a number of men with the superintendent of installation. Their numbers were augmented by others from Philadelphia, Pittsburgh and other Pennsylvania points, and on noon of April 1 the entire party in motor boats, which had been chartered for the occasion, started down the Ohio river for Marietta, this being the only means of approaching the stricken district.

The dispatch with which this particular case was handled is typical of the way in which the Western Electric Company is performing its part in the restoration of the telegraph and telephone service of the country.

The industry has watched with interest the development of the Western Electric Company's distributing facilities, but not until this recent combination of storm and flood has its wonderful organization really been put to the test. It is evident from the above that the company's resources have not been found wanting.

District Manager F. A. Ketcham of the Western Electric Company's Chicago office in speaking of the situation on April 4, said:

"I estimate that before the entire damage is repaired we will ship out approximately 1,000,000 pounds of copper line wire, 7,000,000 or 8,000,000 feet of No. 17 drop wire, 40,000 to 50,000 cross-arms together with the associate hardware, and probably 400,000 pounds of No. 12 iron wire. I understand that the American Telegraph & Telephone Company estimates that it has lost about 4,000 poles and the Western Union Company about 8,000. We have been shipping from our various yards from 20 to 30 carloads of poles a day, this representing not the limit of our resources but rather the transportation facilities available. The loss to the telephone companies in Ohio and Indiana will be less than was originally estimated in so far as central office equipment is concerned. Most of the large switchboards in the flooded districts were, fortunately, located above the ground floors of the buildings and the loss to this equipment will be relatively small.

"The calls upon us for tools, construction outfits, rubber boots and raincoats have been very large. It is interesting to note that we have shipped out within the past week 600 pairs of boots and 600 raincoats.

"At the time of the Chicago storm our automobile trucks demonstrated their utility on long hauls in Chicago and the suburbs. We saved considerable time over delivery by horse-drawn trucks.

"While it is true that our organization has been put to the severest kind of a test, many departments working on a 24-hour basis, and while we are still receiving many emergency calls, we do not feel that our resources are by any means exhausted, and in general have the situation so far as material is concerned, well in hand."

Microphone Aids for the Deaf

It is said that deaf persons can hear better in one definite pitch than in others, and an instrument has recently been devised for the purpose of finding the exact pitch at which a partially deaf person's hearing becomes sensitive. It consists of a series of microphones, each having carbon balls of different size and quality, and a different internal resonance, in conjunction with a number of ear-pieces.

Appeals for Return of Excess Rates

In the Federal Court of Louisville, Ky., Attorney Clayton B. Blakey filed formal notice of appeal as counsel for A. H. Engelhard and other subscribers of the Cumberland Telephone Company from the decision of Judge Evans, refusing to distribute among the subscribers the money collected by the Cumberland Company in excess of the legal rate between 1909 and 1912.

Mr. Blakey's appeal is supplementary to the appeal taken several days previous by City Attorney Beckley for the city and raises exactly the same points. Mr. Blakey contends that Judge Evans has misinterpreted the decision of the United States Supreme Court and that tribunal is requested to rectify the error.

The record in the case has been completed and the matter will probably come up before the Supreme Court some time in May. The regular counsel for the Cumberland Telephone Company will represent Judge Evans before the Supreme Court.

Chief Operators Convene at Rock Island

Ten chief operators of the Central Union Telephone Company, representing the exchanges from Bloomington, Canton, Kankakee, La Salle, Dwight and other cities of the state, convened in the Rock Island, Ill., offices of the Central Telephone Company for a conference which continued from April 21 to the 26th.

During this conference the various phases of the operators' work, both from a long distance and local standpoint, were discussed with a view of becoming more familiar with the work and of rendering conditions better for the subscribers.

The work was in charge of Chief Instructor Miss Lillie Smith of Rock Island, who has charge of the instruction work for the Peoria district. Two sessions were held daily.

New Provisions in Davenport Automatic Purchase

The city council of Davenport, Iowa, at an adjourned meeting, adopted an ordinance granting a franchise to the new Automatic Telephone Company. The franchise followed the lines of the ordinance voted on and approved by the people last year, and contained a number of new provisions further protecting the city's interests. New provisions of the ordinance require that the company have 12,000 telephones contracted for and in operation in the three cities, before it can collect any revenue, and that at least 4,500 of the telephones must be in Davenport; and the company is required to post a bond of $25,000 that it will commence work on its plant within 12 months and complete it within 18 months thereafter.

Simplex Wiring Computer

The Simplex Electrical Company has a wiring computer which it is distributing to the trade. It consists of a celluloid card 3 by 4½ inches on which is mounted a celluloid disc rotatable about a pivot. The disc and card bear figures in black and red, and results are obtained by reading red to red and black to black. For example: To determine the size of conductor necessary to transmit 200 amperes, 1,500 feet with 25 volts loss: Set 1,500 (distance) under 25 (volts lost) and read 250,000 circular mills (size) under 200 (amperes). On the back of the computer is a table desolving circular mills into Brown & Sharpe gauge and giving resistance, weight, etc.

Atlanta Considers Purchase of Company

The Atlanta, Ga., city council wanted to make Alderman James R. Nutting a committee of one to make an investigation as to the feasibility of the city buying for $150,000 the assets of the Atlanta Telephone and Telegraph Company, but Alderman Nutting did not relish tackling the task himself, and after making a brief statement to council he urged the appointment of five members.

Mayor Pro Tem. Warren named Alderman Nutting, chairman, and Councilman Knight, Ashley and Lynch and Alderman Ragsdale on the committee.

Tennessee Commission News

The Tennessee Railroad Commission has received a complaint from the Morristown Home Telephone Company, which alleges that it has exchange connections with the Jefferson City exchange, but that the Knoxville Telephone Company refuses to receive messages transmitted by the Morristown Company through its Jefferson City connections. The commission has the matter under advisement. This is the first complaint of this character that has been brought to the attention of the commission, it having only recently been given jurisdiction in such matters by legislative enactment.

Telefault, not Telafault

W. N. Matthews & Brother, of St. Louis, have decided in view of the fact that most of their customers call their cable fault finding instrument a Matthews' Tel*e*fault instead of Matthews' Tel*a*fault, to substitute the *e* for the *a* and call it Matthews' Telefault in the future.

The same will hold true for Matthews' Teleheight and Matthews' Telepipe. The Telepipe is an instrument similar to the Telefault, but is especially designed for the location of metal pipes of all kinds, which are not over 12 feet underground.

Pennsylvania Commission News

When the Pennsylvania State Railroad Commission met recently at Harrisburg one of the cases out of the ordinary for its docket was a complaint from George W. Scott, of Salem, Ohio, that a telephone company at Greensburg owed him a dime. He went into a telephone booth and dropped ten cents into the slot for a connection with Irwin. He did not get it, but the company got the dime.

A new standard price list on "Sterling" new code rubber covered wire has been issued by the Standard Underground Cable Company, Pittsburgh, Pa. The price list is in convenient and durable booklet form in two colors and gives prices on "Sterling" wire for bases ranging from 13 to 20 cents for solid and stranded wires of all commercial sizes. Appended are explanatory notes and a list of electric wires and cables and cable accessories manufactured by this company. The price list will be sent on request to the company.

Louis Steinberger, president of the Electrose Manufacturing Company, Brooklyn, has been awarded a de-

cision by the court of appeals of the District of Columbia in his interference with Edward N. Hewlett of the General Electric Company in the matter of strain insulators. This is the final hearing in this case and gives priority to Steinberger.

The Scranton Button Company, manufacturer of composition specialties for telephone and electrical insulation, has appointed George T. Westcott & Company, 136 West Lake street, Chicago, as its western representative.

The American Electric Company, Chicago, has devoted a 40-page booklet to "The Remarkable Growth of an Idea," which describe the various adaptations of the Burns' adjustable telephone bracket.

In British North Borneo, according to Consul O. H. Baker, the total mileage of telegraph wire is 625, and of telephone wire 372. There are 160 telephone instruments.

The Buckeye Manufacturing Company, Canton, Ohio, is mailing a circular descriptive of the electric speed for setting poles and repair work. Great claims are made for it.

Brevities of the Business

PERSONAL NOTES.

Charles E. Wilson, general manager and director of the Keystone Telephone Company, Philadelphia, Pa., died there in early April from pneumonia. He had been ill for several months. Mr. Wilson was a prominent independent telephone man, and was 45 years of age at the time of his death.

George W. Burhans has tendered his resignation as secretary of the Portland Telephone Company at Portland, Mich.

Roger V. Scudder, general manager of the Wesco Supply Company, St. Louis, Mo., died suddenly on Saturday, April 12.

Hotchkiss Young of Brownsville, Tenn., has succeeded J. E. Campbell as manager of the Cumberland Telephone Company's business at Hickman, Ky., and has taken charge. Mr. Campbell resigned on account of his health. He had been in Hickman about six months.

H. S. Francisco, who for the past few years has been the manager of the telephone exchange at Rocky Ford, Colo., has gone to California ostensibly for the purpose of taking a vacation, but it is understood that he has been offered the management of another exchange and that he will not return to Rocky Ford. Fred Smith, who recently came to Rocky Ford from the Pueblo exchange, is in charge of the local office and will probably remain in the position.

N. O. P. Syneground has returned to Aberdeen, S. D., from his home in California. He was formerly president of the Groton and Ferney Telephone Company. He expects to dispose of all his holdings in South Dakota and make California his future home.

John Grogan, manager of the Southwestern Telegraph Company, at Arkadelphia, Ark., was married, in April, to Miss Camille Saunders. The Grogans will make their home in Arkadelphia.

William R. Logan, for the past three years manager of the Maryland Telephone Company's office in Elkton, Md., has been transferred to the Havre de Grace office, succeeding H. U. Case, resigned.

W. Roy McCanne, of Rochester, N. Y., who was chosen last fall by the directors of the Stromberg-Carlson Manufacturing Company, to take full charge of the affairs of the concern, has returned from his recent trip to Atlanta, where he went to look after the company's interests in the Atlanta Telephone and Telegraph Company.

E. C. Green, state wire chief of the long distance service of the Bell Company in Columbus, O., to quote the Cincinnati *Star*, worked night and day "allowing himself only a few minutes sleep at a time." His wife was ill at the same time and had to undergo an operation, but despite this terrible distraction Green stuck to his post of duty. Governor Cox has publicly hailed him as hero and it is declared by those who devoted their own time and efforts to the saving of life and property that his efforts alone saved thousands of lives. It is proposed to have the general assembly vote him a medal and Governor Cox said he deserved to be made a major general in the National Guard.

H. O. Davidson, of Seward, Neb., has moved to Utica, Neb., to take charge of the plant and commercial end of the local telephone exchange. William Doyle will continue in charge of the traffic department.

E. W. Moister, auditor of disbursements of the American Telephone and Telegraph Company, died in New York City March 12, 1913. In Mr. Moister's death telephony loses a man whose work has been valuable through its achievements in the cause of economy. The adoption of many of his "short cuts" resulted in the saving of many thousands of dollars to the telephone interests.

Francis B. Badt, one of the most highly esteemed men in the electrical industry, died at his home in Chicago, Ill., on Saturday, April 12. Mr. Badt has served as an expert in a number of patent cases, and has given testimony in suits relating to patents, as well as in many other suits involving questions of electric science. He was 64 years of age at the time of his death, and is survived by a widow and two daughters, Frances and Ernestine.

Fred J. Bennett, chief clerk in the district manager's office of the New England Telephone Company at Fitchburg, has been transferred to the staff of the commercial engineer. John F. Enwright, assistant manager in the Fitchburg exchange, succeeded Mr. Bennett as chief clerk in the district office.

Albert T. Walcott, formerly general manager of the Guarantee Electric Company, Chicago, has joined the staff of the Gregory Electric Company, Chicago.

Clarence J. Messer, one of the directory advertising solicitors of the New England Telephone Company, died at his home in Malden of Bright's disease and bronchial pneumonia. Mr Messer was a well-known magazine writer and author of two notable boys' books, "Next Night Stories" and "Mr. Responsibility, Partner." Early in life, he entered the leather business, afterwards becoming a member of the *Boston Herald* staff and later was engaged in work on the *Transcript*, by which paper he was sent to the Klondike. He wrote considerable about the great gold fever and also lectured for several years on that subject.

ELECTIONS.

The Michigan State Telephone Company has elected directors for the year as follows: Frank W. Blair, Emory W. Clark and Henry Russell of Detroit, Dudley E. Waters and William Judson of Grand Rapids, U. N. Pethell, N. C. Kingsbury and Theodore N. Vail of New York, and Alonzo Burt, D. M. Cummings and B. E. Sunny of Chicago. The next meeting of the directors will be held Thursday, June 12, when it is probable that present officers will be re-elected, including Mr. Waters as vice-president. Report of directors to the stockholders has been approved.

At the annual meeting of the board of directors of the Canton Telephone Company, South Dakota, the books were audited and a satisfactory dividend declared. The following officers were elected: C. B. Kennedy, president; Thomas Thorson, vice-president; Miss Myrna Anderson, secretary.

Officers have been elected as follows for the La Crosse Telephone Company at La Crosse, Wis: President and manager, W. F. Goodrich; vice-president, W. H. Tarbox; secretary and treasurer, C. H. Schweizer; superintendent, J. M. Storkerson.

A meeting of the stockholders of the Huntington & Clearfield Telephone Company was held at Clearfield, Pa., and the reorganization was effected by the election of A. W. Lee, Clearfield, president; John W. Wrigley, Clearfield, vice-president; Singleton Bell, Clearfield, secretary; H. J. Patton, Philadelphia, treasurer. The directors are as follows: A. W. Lee, Clearfield; John W. Wrigley, Clearfield; Singleton Bell, Clearfield; H. J. Patton, Philadelphia, and Rembrandt Peale, New York.

The meeting of the directors of the Farmers Telephone Company of Brushy Prairie, Ind., G. F. Greenawalt was elected

president and Arthur Hall re-elected secretary of the company. The term of the treasurer, Elmer Fellers, has not yet expired.

The annual meeting of the stockholders of the People's Telephone & Telegraph Company at Knoxville, Tenn., was held in the office of the company on Commerce avenue. The following officers were re-elected for the ensuing year: President, J. C. Duncan; vice-president, C. E. Lucky; secretary, Fred G. Denton. The following were elected directors: C. E. Lucky, S. B. Tuttrell, J. C. Duncan, Asa Hazen, H. B. Branner. The company reported a very prosperous year, having changed their system from the old style of cranking to the central energy equipment. A good growth in business and many new exchanges opened up in adjoining counties were reported. The regular annual dividend was paid.

NEWS FROM THE FIELD.

ARIZONA.

Improved telephone service in Tucson and, in fact, all over Arizona, is promised by C. E. Stratton of El Paso, division manager of the Mountain States Telephone & Telegraph Company. Mr. Stratton stated that the company intended to make needed improvements in the service just as soon as possible.

ARKANSAS.

A deal was completed whereby the Texarkana Telephone Company took over the local property of the Southwestern Telephone Company, including exchange, telephones, etc. The two systems consolidated under one management and are operated from one exchange. Telephone rentals for residence remains the same, $2 per month, while business telephones have raised from $3 to $4 per month.

The Southwestern Telegraph and Telephone Company is building a three-story addition to its main building at the south-east corner of Seventh and Louisiana streets, Little Rock, and also is adding another story to the old structure. The entire building is expected to be finished about the last of May and the improvements and alternations will represent an expenditure of about $75,000. It will give the company much additional room, which its constantly increasing business has made an imperative necessity.

CALIFORNIA.

The 40-mile line between Gazelle and Etna has been completed by the Gallahan Co-operative Telephone Company and arrangements are now being made with the Siskiyou Telephone Company, which operates in the western part of Siskiyou county, to connect with the system at Etna. It is reported that the Siskiyou company contemplates the establishment of an all night office at Etna, to rebuild a line to Sawyers Bar and to run several new lines into the valley.

The Pacific Telephone and Telegraph Company has moved its exchange to more commodious quarters at Wasco, strung a lot of cable and put in a number of new telephones.

Officials of the Pacific Telephone & Telegraph Company, San Francisco, which has over 5,000,000 subscribers in California, Oregon and Washington, are contemplating an expenditure of $111,600 for improvements and extensions to the company's system.

COLORADO.

The Omar Telephone Company, with C. A. Watson as secretary, and L. H. C. Milholm, treasurer, is anxious to bring a line into Fowler from the Omer county. The object, the officers state, is to have connection with this city on a line of their own. To this end they have appealed to the city council for permission to enter the city with one line. The council is willing to grant the request, and pending ascertaining whether a franchise is necessary, defrayed action until the next meeting.

The telephone company expects to put in a short line at Highlandlake which will extend the line so there will be several more new telephones.

FLORIDA.

The telephone exchange at West Palm Beach is to have a new home. M. E. Gruber, president of the West Palm Beach Telephone Company, has purchased from the G. G. Strohm Company, the fractional lot back of the Strohm store on Olive street. He has had the warehouse which occupied this site removed and ground has been broken for the building. It will be three stories high.

GEORGIA.

Fire that broke out in the Southern Bell Telephone Company's building at Macon at 12:15 o'clock one recent morning drove five telephone operators from the switchboards and threatened to greatly damage the valuable plant. The girls escaped down the fire escape from the operating room on the third floor. It was 2 o'clock before the fire, which started from a boiler that had been fired up because of the cold snap, was extinguished.

Application has been made at Dalton for a charter for the Farmers' Telephone Company, the incorporators being fourteen prominent residents of Carbondale. The lines will extend through Redwine's cove and connect with the Dalton Telephone Company's lines, giving service to a large number of families. The capital stock of $500 is fully paid in, petitioners asking the privilege of increasing it to $2,500.

Effective May 1 telephone rates in Waycross are increased fifty cents on business and residence service. This is in accordance with an agreement entered into by the city last year, when the telephone company agreed to erect a modern telephone building and furnish Waycross the common battery type of telephone. The increase in rates has been approved by the railroad commission and will go into effect without a hitch.

IDAHO.

All the material is on the ground for the construction of a telephone line from the Corbin ranch at Hayden lake over to the headwaters of the Little North Fork of the Coeur d'Alene river, thence down the Little North Fork to what is known as the Cox cabin and from there down the river to Lieberg creek. Another line will be built which will connect with the forest service line at Cox cabin and with the line built last year by the association from the mouth of the Little North Fork to Lieberg creek. Wire and equipment are also on the ground for the construction of a line from Clarks Forks, Idaho, 15 miles over the hill to the Big Meadows at the headwaters of Deep creek.

ILLINOIS.

According to Alderman Genebacher, the Home Telephone Company of Quincy has failed to live up to its agreement to install within a period of six months private systems of police and fire signals, and he has introduced a resolution to the effect that in the event the company did not comply within sixty days with the requirement, the thirty-five year ordinance granted be declared void.

WISCONSIN.

The farmers of East Dunkirk and West Albion have formed an independent telephone company. It will have four wires and twenty stockholders.

The La Crosse Telephone Company has acquired all of the common stock and in addition a large amount of preferred stock of the La Crosse Interurban Telephone Company. There is also $30,000 in secured mortgage bonds held locally. The Interurban company owns and controls most of the rural lines in the vicinity of La Crosse and connects with the exchanges of the La Crosse Telephone Company. First mortgage bonds for $15,000 have been authorized for the further extension of the system.

WYOMING.

Dr. L. G. VanSlyke has recently taken over the telephone line formerly known as the Burke line and is giving service to the people of the Tensleep and Paintrock country. He has a satisfactory understanding with the Bell people.

Statement of the ownership, management, etc., of TELEPHONE ENGINEER, published monthly, at Chicago, Ill., required by the Act of August 24, 1912.

NOTE—This statement is to be made in duplicate, both copies to be delivered by the publisher to the postmaster, who will send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office.

NAME OF — POST-OFFICE ADDRESS

Editor, PAUL H. WOODRUFF — 7025 Yale Ave., Chicago, Ill.

Managing Editor and Business Manager, ED J. MOCK, 6549 Harvard Ave., Chicago, Ill.

Publisher, ELECTRICITY MAGAZINE CORPORATION, 1457-1460 Monadnock Bldg., Chicago, Ill.

OWNERS: (If a corporation, give names and addresses of stockholders holding 1 per cent or more of the total amount of stock).

ED J. MOCK, - - - - - - 6549 Harvard Ave., Chicago, Ill.
B. C. SAMMONS, - - - - - - - - - - Blue Island, Ill.
JOHN CROCKER, - - - - - - - - - - Maroa, Ill.

Known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of bonds, mortgages, or other securities:

There are no bonds, mortgages or other securities outstanding against TELEPHONE ENGINEER.

ED J. MOCK, *Business Manager*.

Sworn to and subscribed before me this thirty-first day of March, 1913.

(Seal) LEONA J. EKSTROM.

My commission expires Aug. 17, 1914.